DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT, CORPS OF ENGINEERS
696 VIRGINIA ROAD
CONCORD, MASSACHUSETTS 01742-2751

REPLY TO
ATTENTION OF

January 4, 2013

Engineering/Planning Division
Geo-Environmental Engineering Branch

Ms. Lynne Jennings
EPA - New England, Region 1
5 Post Office Square - Suite 100
Mail Code OSRR7-3
Boston, Massachusetts 02109-3912

Mr. Len Pinaud
Commonwealth of Massachusetts
Department of Environmental Protection – Southeast Regional Office
20 Riverside Drive
Lakeville, Massachusetts 02347

Re: Impact Area Groundwater Study Program (IAGWSP), Final J-1 Range Northern 2011 Interim Environmental Monitoring Report and J-1 Range Southern Annual 2011 Environmental Monitoring Report, dated December 2012

Dear Ms. Jennings and Mr. Pinaud:

On behalf of the Army National Guard's Impact Area Groundwater Study Program (IAGWSP), the U.S. Army Corps of Engineers (USACE) is pleased to provide the Final version of the subject report.

The Draft version of this document was submitted in July 2012. Comments were received from the U.S. Environmental Protection Agency (EPA) in a letter dated August 1, 2012, and from the Massachusetts Department of Environmental Protection (MassDEP) in a letter dated July 18, 2012. A Response to Comments Letter (RCL) was written on September 12, 2012. MassDEP approved the RCL in a letter dated September 20, 2012. EPA provided additional comment by e-mail on October 11, 2012, indicating that the well re-survey recommended in EPA specific comment number 2 be performed in calendar year 2012. A maintenance survey of selected monitoring wells was completed in early December, 2012, in accordance with Specific Comment #2 of the approved RCL for the J-1 Range Southern Annual 2011 Environmental Monitoring Report. Due to in-accessibility of the on-base extraction wellhead sounding tube in J1SEW0001, the surveyor will be re-scheduled to re-survey this well during the off-base start-up test for J1SEW0002.

A signed Project Note summarizing the changes to the chemical and hydraulic monitoring well network is included as Appendix A and Appendix C of the J-1 Range Northern and Southern Environmental Monitoring reports, respectively.

Please contact Dave Hill of the IAGWSP, or Mark Anderson of the USACE, if there are any questions.

Sincerely,

Anthony T. Mackos, P.E.
Chief, Engineering/Planning Division

Enclosures
EPA 1 copy and 1 CD
MassDEP 1 copy and 1 CD

Copy Furnished:
IAGWSP: Ben Gregson (letter only), Dave Hill (1 copy), and Marcia Goulet (5 copies and 2 CDs)
EPA: Jane Dolan (1 copy), Erin Sanborn (1 CD)

Impact Area Groundwater Study Program

FINAL

J-1 Range Northern
2011 Interim Environmental Monitoring Report

and

J-1 Range Southern
Annual 2011 Environmental Monitoring Report

Camp Edwards

Massachusetts Military Reservation

Cape Cod, Massachusetts

December 2012

Prepared for:

Army National Guard
Impact Area Groundwater Study Program
Camp Edwards, Massachusetts

Prepared by:

U.S. Army Corps of Engineers
New England District
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DISCLAIMER

This document has been prepared pursuant to government administrative orders (U.S. EPA Region I SDWA Docket No. I-97-1019 and 1-2000-0014) and is subject to approval by the U. S. Environmental Protection Agency. The opinions, findings, and conclusions expressed are those of the authors and not necessarily those of the Environmental Protection Agency.

TABLE OF CONTENTS

Page

List of Figures

List of Tables

List of Appendices

ACRONYMS AND ABBREVIATIONS

HMX	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
IAGWSP	Impact Area Groundwater Study Program
IGMP	Interim groundwater monitoring program
MMR	Massachusetts Military Reservation
MCL	Maximum contaminant level
MMCL	Massachusetts maximum contaminant level
ND	Non-detect
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
SVOC	Semivolatile organic compounds
VOC	Volatile organic compounds
µg/L	Micrograms per liter

1.0 INTRODUCTION

This J-1 Range Northern 2011 interim groundwater environmental monitoring report presents the results of groundwater monitoring activities from January 1, 2011 through December 31, 2011.

The J-1 Range is located adjacent to and southeast of the Massachusetts Military Reservation (MMR) Impact Area, and is one of the four former training ranges that comprise the Southeast Ranges (Figure 1-1). The Southeast Ranges are former military training ranges and defense contractor test ranges that operated from 1935 to 1997. The J-1 Range, in particular, was used from 1935 through the 1980s for training and testing purposes.

The J-1 Range Northern plume consists of groundwater contaminated with levels of perchlorate above the Massachusetts maximum contaminant level (MMCL) of 2 micrograms per liter (µg/L) and the EPA Health Advisory of 15 µg/L. The plume also contains hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) above the risk-based concentration of 0.6 µg/L, the Massachusetts Contingency Plan Groundwater-1 Standard of 1 µg/L, and the EPA Health Advisory of 2 µg/L. Current approximate dimensions of the plume based on 2011 water quality data are as follows: the perchlorate plume (above 2 µg/L) is approximately 3,750 feet long and approximately 600 feet wide at the widest point. The main RDX lobe (above 0.6 µg/L) is approximately 3,700 feet long and 600 feet wide at its widest point. The J-1 north plume is associated with the “Interberm” Area of the J-1 Range. Figure 2-1 illustrates the perchlorate and RDX plumes in plan-view relative to their respective regulatory thresholds. Results of groundwater samples collected in the J1 Northern plume in May and November 2011 are covered by this report.

Additionally, groundwater profile data for perchlorate and RDX were obtained during six aquifer profiles completed in 2011, from which four monitoring wells were constructed. The water quality data collected from the profile/wells were used to update the plumes presented in Figure 2-1.

2.0 SAMPLING PROGRAM

The purpose of the J-1 Range Northern interim groundwater monitoring program (IGMP) is to monitor the J-1 Range Northern groundwater plume until a final remedy is selected and implemented for the J-1 Range Northern Groundwater Operable Unit. Perchlorate and RDX are considered the primary constituents for monitoring of this plume. Nested wells are labeled with the identifier "M1", "M2", "M3" or "M4" with the lower number indicating the deepest well and the higher number indicating the shallowest well at a particular location.

The annual sampling round was conducted in May 2011, and the second (semi-annual) round was conducted in November 2011. Additionally, profile samples were collected from six sonic borings designated MW-561 (DW-4), MW-562 (DW-5), MW-563 (DW-6), MW-564 (DW-7), MW-566 (DW-8), and MW-567 (DW-9) during the period June – October, 2011. New monitoring wells were installed at four of the profile locations (MW-563, MW-564, MW-566, and MW-567) and each of these new wells were sampled at least once in 2011. Sampling will continue as part of the J-1 Range Northern IGMP until a final remedy has been implemented for the J-1 Range Northern plume. A decision document, requiring the installation of a two-well extraction, treatment and infiltration (ETI) system for the J-1 Range Northern plume, was issued by EPA on May 23, 2011 (EPA, 2011).

As part of the J-1 Range Northern IGMP, monitoring wells are sampled on an annual or semiannual basis. The approved monitoring plan, including specific analyses [i.e., perchlorate, explosives, volatile organic compounds (VOC), and/or semivolatile organic compounds (SVOC)] and sampling frequencies is presented in the *Final J-1 Range North Interim Groundwater Monitoring Submittal* (ECC 2008a). Any changes to this plan will be reflected in subsequent annual environmental monitoring reports. The approved chemical monitoring network is presented in Table 2-1 and Figure 2-1. Sample collection, field monitoring equipment calibration, and maintenance were conducted in accordance with approved procedures in the *Draft Generic Quality Assurance Plan* (ECC 2007). There were no deviations to the sampling program.

3.0 MONITORING TRENDS

Perchlorate, explosives, VOC and SVOC results, and groundwater levels are presented in the following section. The groundwater quality results are presented in Table 3-1. The distribution of perchlorate and RDX detections are shown in Figures 3-1 and 3-2, respectively. Concentrations of perchlorate and RDX measured in profile samples and at newly installed wells are also discussed. The contoured groundwater elevations measured during the May 2011 and November 2011 surveys are shown in Figures 3-3 and 3-4, respectively.

3.1 Perchlorate

The following is a description of the perchlorate concentrations measured during 2011, in wells located within and proximate to the J1 Range Northern plume (Figure 3-1). The concentrations highlighted and discussed are from the wells with the highest historical perchlorate concentrations.

Within the upgradient portion of the perchlorate plume, MW-303M2 is screened at the approximate elevation of the plume core. This well initially had elevated concentrations of perchlorate but has since remained consistently low (3.9 µg/L, May 2011; and 5.1 µg/L, November 2011). At MW-164M1, perchlorate concentrations remain below 1 µg/L (0.41 µg/L, May 2011).

Within the middle of the perchlorate plume, concentrations at MW-346M1 increased slightly (43.9µg/L, May 2011) at this deep well compared to the two previous years, likely indicating the continued downgradient migration of the more highly concentrated part of the plume previously seen in well MW-303M2. East of MW-346, concentrations have increased slightly at MW-326M2 (13.2 µg/L, May 2011), following a similar trend observed at MW-346M1. At the deeper well at this cluster, perchlorate concentrations have remained consistently low at MW-326M1 (ND, May 2011; ND November 2011) and MW-326M3 (ND, May 2011). Downgradient of MW-346, perchlorate concentrations at MW-265M2 continued to decline slightly (11.7 µg/L, May 2011) compared to its peak six years ago , and may confirm the assumption of an intermittent release history from the source area. Perchlorate concentrations continue to be very low at MW-265M1 (ND, May 2011) and MW-265M3 (0.46 µg/L, May 2011) and confirm the lower and upper boundaries, respectively, of the plume. Continued monitoring at MW-265M2 may detect the migration of higher concentrations of perchlorate from upgradient areas in the near future.

In the downgradient portion of the plume, perchlorate concentrations at the intermediate depth well MW-286M2 show a significant downward trend (0.31 µg/L, May 2011) compared to last year's concentration, suggesting that the western boundary of the J-1 Range Northern plume may be dynamic due to seasonal influences on the direction of groundwater flow, or the western boundary of the plume may be establishing itself east of MW-286 (Figures 3-3 and 3-4). At intermediate depth well MW-370M2 concentrations have continued to decrease (13.5 µg/L, May 2011; 8.3 µg/L, November 2011) since the 2008 historic maximum perchlorate concentration of 78 µg/L.

Recently added downgradient wells to the chemical monitoring network include two well clusters with two screens at each well cluster location: MW-547 (leading edge) and MW-549 (downgradient). Following standard protocol, each of the four new wells was sampled on a tri-annual basis in 2011 in April, August, and December, 2011. At deep well MW-547M1 the perchlorate concentration was ND for all three samples, while at intermediate depth well MW-547M2, the perchlorate concentration was less than 1 µg/L for all three samples (0.3 µg/L, April 2011; 0.24 µg/L, August, 2011; 0.19 µg/L, December 2011).

At deep well MW-549M1, slightly southeast and upgradient of MW-547, perchlorate was detected in all three samples, with two samples greater than 2 µg/L (0.64 µg/L, April 2011; 3.6 µg/L, August 2011; 4.2 µg/L, December 2011). At intermediate depth well MW-549M2, the perchlorate concentration was less than 1 µg/L for all three samples (0.10 µg/L,, April 2011; 0.11 µg/L, August, 2011; 0.10 µg/L, December 2011).
The downgradient perchlorate concentrations in all seven monitoring wells sampled along Wood Road were all ND in 2011 (Table 3-1 and Figure 3-1).
Perchlorate concentrations in various other monitoring wells located on the periphery of the plume have continued to remain very low or ND.

3.2 RDX

The following is a description of the RDX concentrations measured during 2011, in wells located within and proximate to the J-1 Range Northern plume as part of the J1 Range Northern RDX explosives monitoring program (Table 2-1, Table 3-1 and Figure 3-2). Concentration trends are discussed for those wells with the highest historical RDX concentrations.

In the most upgradient portion of the J-1 Range Northern RDX plume, RDX concentrations remain below 0.6 µg/L including MW-136S (0.28, May 2011) and MW-191M2 (0.20 µg/L, May 2011). RDX concentrations at MW-166 continue to fluctuate slightly but remain low, with the most recent concentrations of ND, ND, 0.32 µg/L at MW-166M1, M2, and M3, respectively. For the second year in a row at MW-164M2, concentrations for RDX were ND (May 2011). RDX concentrations at MW-303M2 in the upgradient core of the plume were generally consistent with the previous five years of data (14.0 µg/L, May 2011; 17.4 µg/L, November 2011), and at MW-303M3 concentrations remained at comparable levels measured since 2008 (1.6 µg/L May 2011; 1.3 µg/L November 2011). The current maximum RDX concentration in the upgradient portion of the plume remains at MW-303M2 (17.4 µg/L, November 2011), though after a several year downward trend beginning in 2005 the concentrations have been slightly increasing during the past two sampling years, but remain approximately half the highest concentration of 32 µg/L for MW-303M2 recorded in March, 2004.

There were also fluctuating RDX concentrations in the middle of the RDX plume. Along the axis of the plume, RDX concentrations have increased slightly. At MW-346M1 concentrations increased from 0.37 µg/L in 2010 to 0.97 µg/L (May 2011). At MW-346M2 RDX was detected at a concentration of 4.76 µg/L, an order of magnitude higher than the last sampling date for this well (0.41 ug/L, January, 2006). However, RDX decreased significantly at well MW-346M3 from 5.34 µg/L in 2010 to 0.29 µg/L (May 2011). The concentration at shallow well MW-346M4 has been ND since 2006.

There are several results consistent with previous findings. Along the eastern side of the plume at deep well MW-326M1, concentrations have been ND since sampling commenced in June 2004, while a significantly increased concentration was measured for the second year in a row at MW-326M2 where the RDX concentration more than doubled compared to the previous year to reach the current maximum, and a new all-time maximum, RDX concentration in a well for the J1 Range Northern plume (34.6 µg/L, May 2011; 15 µg/L, May 2010). However, at shallow well MW-326M3 the RDX concentration was ND (May 2011) for the second year in a row following a decrease from previous levels (6.2 µg/L June 2008 and 2.2 µg/L May 2009). Along the western side of the plume, RDX concentrations at MW-306M1 and M2 continued to decline to 0.26 µg/L and ND (May 2011), respectively. At MW-369M1, RDX concentrations were consistent at 2.0 µg/L and 2.3 µg/L (May 2011; November 2011), and samples from the MW-369M2 screen depth have been ND since November 2006.

Along the axis of the plume at well MW-265, RDX concentrations in the M1 screen remain ND while concentrations remain consistent in the M2 screen (2.5 µg/L, May 2011). In the M3 screen concentrations remain slightly elevated (3.0 µg/L, May 2011).

In the downgradient portion of the RDX plume there were some decreasing and some stable RDX concentrations. RDX concentrations decreased slightly compared to the 2010 level at MW-286M2 (ND, May 2011) and remained ND at MW-286M1. Concentrations at MW-370M2 decreased slightly compared to 2010 (1.6 µg/L, May and November 2011; 2.5 µg/L November 2010), and remained stable at MW-370M3 (ND May 2011). There were no RDX detections downgradient of the plume in the monitoring wells along Wood Road.

3.3 HMX

During the reporting period HMX was detected at a maximum concentration of 4.7 µg/L at upgradient intermediate depth well MW-303M2 (November 2011), which was a slight increase compared to the HMX concentration of 4.1 µg/L at MW-303M2 (November 2010). (The MCP GW-1 standard for HMX is = 200 µg/L).

Most of the HMX detections were observed at monitoring wells with previous detections at similar concentrations. Concentrations of HMX at MW-164M2 decreased (ND, May 2011; 0.33 µg/L, May 2010); continued to remain ND at MW-326M3 (ND, May 2011; ND, May 2010), and decreased at MW-191M2 (ND, May 2011; 1.2 µg/ L, May 2010).

3.4 Other Results

The only explosive, other than perchlorate, RDX and HMX detected in the monitoring wells was 4-amino-2,6-dinitrotoluene at shallow upgradient wells MW-166M3 (0.98 µg/L, May, 2011) and MW-303M3 (0.72 µg/L, May 2011; 0.86 µg/L, November 2011), The occurrence of 4-amino-2,6-dinitrotoluene, which is a biodegradation compound formed from the degradation of TNT (2,4,6- trinitrotoluene) is observed to be coincident with parts of the plume that exhibit some of the highest concentrations of RDX and HMX such as near well cluster MW-303; however, 4-amino-2,6-dinitrotoluene did not occur in the middle eastern part of the plume that exhibited the highest RDX concentration in 2011 at MW-326M2, which may be attributable to attenuation factors.

Samples collected from two wells, MW-187D and MW-306D, located along the western perimeter of the plume were analyzed for SVOCs and VOCs. At MW-187D, six VOC compounds (, Benzene, Ethylbenzene, Toluene, M,P-Xylene, O-Xylene, and Total Xylenes) and 4 SVOC compounds (2-Methylnaphthalene, Fluorene, Naphthalene, and Phenanthrene) were detected. The benzene concentration was consistent with the previous sample round (19.0 µg/L, May, 2011; 18.0 µg/L, May 2010) [maximum contaminant level (MCL) = 5 µg/L]. All of the other VOC and SVOC detections were below the applicable MCL, MMCL, or Massachusetts drinking water guideline(s). All of the VOC and SVOC detections at MW-187D were generally consistent with previous results.

The only VOC detected at MW-306D was chloroform which remained consistent with the previous year (0.46 µg/L, May 2011; 0.48 µg/L, May 2010). No SVOCs were detected in MW-306D during the May 2011 sample survey, which was consistent with the May 2010 data.

3.5 Perchlorate Data from Profile Boring – 2011

From June 2011 until October 2011, profile water quality samples were collected from six borings at the downgradient leading edge and middle portion of the perchlorate and RDX plumes at the following locations: MW-561 (DW-4), MW-562 (DW-5), MW-563 (DW-6), MW-564 (DW-7), MW-566 (DW-8), MW-564 (DW-9) (Figure 2-1 and Table 3-2). Subsequent to the completion of the profiles, four new monitoring wells were installed.

At MW-561, located west of the perimeter of the main plume leading edge, nine groundwater samples were collected from 160 feet to 266 feet below grade. All samples were reported to contain trace concentrations of perchlorate below the Method 6850 reporting limit of 0.20 µg/L, with the maximum concentration being 0.16J µg/L (180 to 185 feet below grade). These profile groundwater samples indicated that MW-561 was located outside of the western perimeter of the plume, so no well was installed at MW-561.

At MW-563, located approximately 150 feet east of MW-561, seven groundwater profile samples were collected from depths of 159 feet to 223 feet below grade. All samples were reported to contain trace levels of perchlorate, with the six most shallow samples collected from 159 feet to 213 feet below grade reporting perchlorate at estimated concentrations (J-values) below the method reporting limit of 0.20 µg/L; the maximum concentration of 1.4 µg/L was detected at the seventh and deepest sample interval from 219 to 223 feet below grade (-29.11 to -33.11 ft msl). Monitoring well MW-563M1, was installed and screened from a depth of 215 to 225 feet below grade (-24.91 to -34.91 ft msl). MW-563M1 was sampled twice in 2011 with trace concentrations of perchlorate detected in both samples (0.26 µg/L, September 2011; 0.42 µg/L, December 2011).

The profile sample results of MW-561 and MW-563 suggest that the western perimeter of the plume (perchlorate exceeding 2 µg/L) occurs slightly east of MW-563.

At MW-562, located along the eastern perimeter of the plume leading edge groundwater profile samples were collected from nine depth intervals at between 150 to 235 feet below grade. All samples contained trace (estimated) concentrations of perchlorate

below the method reporting limit, with the maximum estimated concentration of 0.16 J µg/L occurring at a depth interval of 170 feet to 175 feet below grade. No well was installed at MW-562.

At MW-564, located between monitoring well MW-549 and profile boring MW-562 groundwater profile samples were collected from nine depth intervals between 168 to 271 feet below grade. Eight samples contained perchlorate with trace concentrations below or slightly above the method reporting limit at depths ranging from 168 to 220 feet below grade. A maximum concentration of 33.3 µg/L was reported from the depth interval of 229 feet to 232 feet below grade. This maximum concentration is generally consistent with values projected based on groundwater travel time and distances relative to upgradient intermediate depth well MW-370M2 which had a peak perchlorate concentration of 78 µg/L in November, 2008, and 35.5 µg/L in October, 2009. Monitoring well, MW-564M1, screened from 227 to 237 feet below grade, was installed at this location.. MW-564M1 was sampled twice in 2011 and had elevated concentrations of perchlorate interpreted to be representative of the downgradient core of the perchlorate plume (8.3 µg/L, September 2011; 21.6 µg/L, December 2011).

At MW-566, groundwater profile samples were collected from nine depth intervals between 167 to 250 feet below grade. Concentrations exceeding the perchlorate GW-1 standard of 2 µg/L were detected at two depth intervals, ranging from 227 feet – 230 feet below grade (3.1 µg/L) and 237 feet – 240 feet below grade (6.4 µg/L). Monitoring well, MW-566M1 was installed at this location at a depth of 232 to 242 feet below grade. MW-566M1 was sampled once in 2011 and had an elevated concentration of perchlorate interpreted to be representative of the leading edge of the perchlorate plume (9.5 µg/L, December 2011).

At MW-567, located on the eastern perimeter of the plume approximately midway between MW-265 and MW-370, groundwater profile samples were collected from thirteen depth intervals from 157 feet to 280 feet below grade. All samples contained trace or higher concentrations of perchlorate except the deepest sample from 277 feet – 280 feet below grade that was an ND. The maximum profile concentration and only sample to exceed the perchlorate GW-1 standard for perchlorate was 11.3 µg/L detected at a depth of 217 – 220 feet below grade. Monitoring well MW-567M1 was installed at this location at a depth of 215.5 to 225.5 feet below grade. MW-567M1 was sampled once in 2011 and was found to have a low concentration of perchlorate (1.6 µg/L (December 2011).

3.6 RDX Data from Profile Borings – 2011

All profile samples that were collected from the six 2011 borings at the downgradient leading edge and middle portion of the J-1 northern plume were also analyzed for RDX. A discussion of RDX in these profiles and new well installations is presented below.

At MW-561, nine groundwater samples were collected from 160 feet to 266 feet below grade. All samples were determined to be non-detect (ND) for RDX at all intervals sampled.

At MW-563, seven groundwater profile samples were collected from 159 feet to 223 feet below grade. All sample intervals were determined to be non-detect (ND) for RDX. MW-563M1 was sampled twice in 2011, and RDX was not detected in either sample.

At MW-562, nine groundwater profile samples were collected from 150 feet to 235 feet below grade. All samples were determined to be ND for RDX.

At MW-564, nine groundwater profile samples were collected from 168 feet to 271 feet below grade. All samples were determined to be ND for RDX at all intervals sampled. MW-564M1 was sampled twice in 2011, and low concentrations of RDX were detected in both samples (0.27 µg/L, September 2011; 0.56 µg/L, December 2011), suggesting that MW-564M1 was located within the leading edge of the RDX portion of the J-1 North plume.

At MW-566, nine groundwater profiles samples were collected from 167 feet to 250 feet below grade. Two intervals had trace concentrations with 0.027 µg/L detected from 227 – 230 feet below grade, and 0.31 µg/L detected from 237 – 240 feet below grade. MW-566M1 was sampled once in 2011 and was found to have low concentrations of RDX (0.35 µg/L, December 2011).

At MW-567, thirteen groundwater profile samples were collected from 157 feet to 280 feet below grade. One sample collected from 217 feet to 220 feet below grade had an RDX concentration of 0.45 µg/L. MW-567M1 was sampled once in 2011 and was found to have a trace concentration of RDX (0.092 µg/L -December 2011).

In general, the new profiles served to confirm and refine the trajectory of the plume toward MW-401 on Wood Road, compared to previous estimated plume tracks toward MW-540. The profiles also served to refine the interpretation of the location of the western and eastern perimeters of the perchlorate and RDX plumes.

3.7 Groundwater Elevations

Groundwater elevations were measured at a subset of the J-1 Range Northern monitoring wells during both the May 2011 and the November 2011 sampling surveys. Measured groundwater elevations indicate a south to north groundwater flow direction under a gradient of 0.00053 (ft/ft) during the May 2011 survey, and 0.0005 (ft/ft) during the November 2011 survey. Measured groundwater elevations ranged from 70.24 feet to 73.33 feet during the May 2011 survey, and from 70.77 feet to 73.24 feet during the November 2011 survey.

Groundwater contours are illustrated in Figures 3-3 and 3-4. Where multiple wells exist at a cluster location, the well screen closest to the plume elevation was utilized for groundwater contours. Based on the groundwater contours, there may be a slight seasonal variation of flow direction observed in 2011, with a slightly more northwest flow direction in May than in November. However, this interpretation may be a result of fewer data points on which the November groundwater contours were developed.

4.0 RECOMMENDATIONS

This section identifies the proposed optimization of the explosives and perchlorate monitoring well network (Section 4.1).

4.1 Chemical Monitoring Network Optimization

As described in Sections 3.5 and 3.6, six new profile samples were collected from borings at the downgradient leading edge and middle portions of the perchlorate and RDX plumes. Based on the chemical results, four of the locations were selected for the installation of monitoring wells: MW-563M1, MW-564M1, MW-566M1, and MW-567M1.

It is recommended that new monitoring wells MW-563M1 and MW-567M1 be sampled annually for perchlorate and explosives to confirm the location of the western and eastern perimeters of the plume. It is recommended that new monitoring wells MW-564M1 and MW-566M1 be sampled semi-annually for perchlorate and explosives to monitor the leading edge of the plume.

In addition, based on the record of consistency of results below risk-based standards, the following changes to monitoring frequency are recommended:

Source/Near Source Wells

- MW-166M3: This well has been sampled annually for explosives and perchlorate, and is located upgradient of the 2 µg/L perchlorate plume contour. Perchlorate has been ND or below the part per billion range in 14 samples since July 2003 and at this juncture is detached from the source. It is recommended that perchlorate sampling be discontinued at this well.

Downgradient of Source Area

- MW-205M1: This well has been sampled for explosives semi-annually from April 2002 until May 2011. RDX is generally non-detect, with one episode of two detections in May and July 2005 of 1.1 ppb and 0.9 ppb, respectively, followed by an estimated detection of 0.38 µg/L in December 2005, and then six rounds of non-detect from July 2008 to May 2011. The location of MW-205M1 being downgradient on Wood Road is to the west of the trend of the western perimeter of the plume. It is recommended that sampling of MW-205M1 be discontinued entirely and that the well be removed from the chemical monitoring network.

- MW-220M1: This well has been sampled semi-annually for explosives and perchlorate, and is located west of the perimeter of the plumes. Perchlorate has been ND or below the part per billion range in 15 samples since August 2002, and RDX has been non-detect in 22 samples since August, 2002. It is recommended that it be sampled annually for explosives and perchlorate.

- MW-253M1: This well has been sampled semi-annually for explosives and perchlorate, and is located west of the perimeter of the plumes. Perchlorate and

RDX have been ND in 17 samples since April, 2003. It is recommended that this well be sampled annually for explosives and perchlorate.

- MW-326M1: This well has been sampled semi-annually for explosives and perchlorate, and is located on the eastern/middle portion of the plumes. Perchlorate has been ND or below the part per billion range in 17 samples since June, 2004, and RDX has been non-detect in 17 samples since June, 2004. It is recommended that this well be sampled annually for explosives and perchlorate.

- MW-369M1: This well is located west of the main plume and within an RDX plumelet. This well has been sampled semi-annually for explosives and perchlorate. Perchlorate has consistently been detected at slightly above 1 µg/L, since June 2008 and RDX has averaged approximately 2.4 µg/L, in 8 samples since June 2008. Due to the consistently reported results it is recommended that this well be sampled annually for explosives and perchlorate.

- MW-369M2: This well has been sampled annually for explosives and perchlorate, and is screened approximately 38 feet above the screen for MW-369M1. Perchlorate has been ND or below the part per billion range in 13 samples since July, 2005, and RDX has been ND in 9 samples since November 2006. It is recommended that sampling of MW-369M2 be discontinued entirely and that the well be removed from the chemical monitoring network.

Table 4-1 summarizes the proposed monitoring well sampling frequency and parameters and Figure 4-1 shows the proposed perchlorate and explosives monitoring well network. The approved changes to the monitoring well network are described in the Project Note (included in Appendix A).

4.2 In-Plume & Downgradient Profile Characterization

A Project Note dated March 2012 describes two additional aquifer profile locations at MW-401 and at MW-245 that will complete pre-design characterization of the the plume in the vicinity of the plume core (MW-245) and leading edge near Wood Road (MW-401).

5.0 REFERENCES

ECC, 2010 (July) Final J-1 Range Remedial Investigation/Feasibility Study. Prepared by ECC for U.S. Army Corps of Engineers, New England District, Concord, MA. (Environmental Data Management System (EDMS) Document ID 38456).

ECC, 2008a (October). *Final J-1 Range North Interim Groundwater Monitoring Submittal.* Prepared by ECC for U.S. Army Corps of Engineers, New England District, Concord, MA. (EDMS Document ID 9137).

ECC, 2008b (April). *J-1 Range North Interim Groundwater Monitoring Submittal.* Prepared by ECC for U.S. Army Corps of Engineers, New England District, Concord, MA. (EDMS Document ID 9047).

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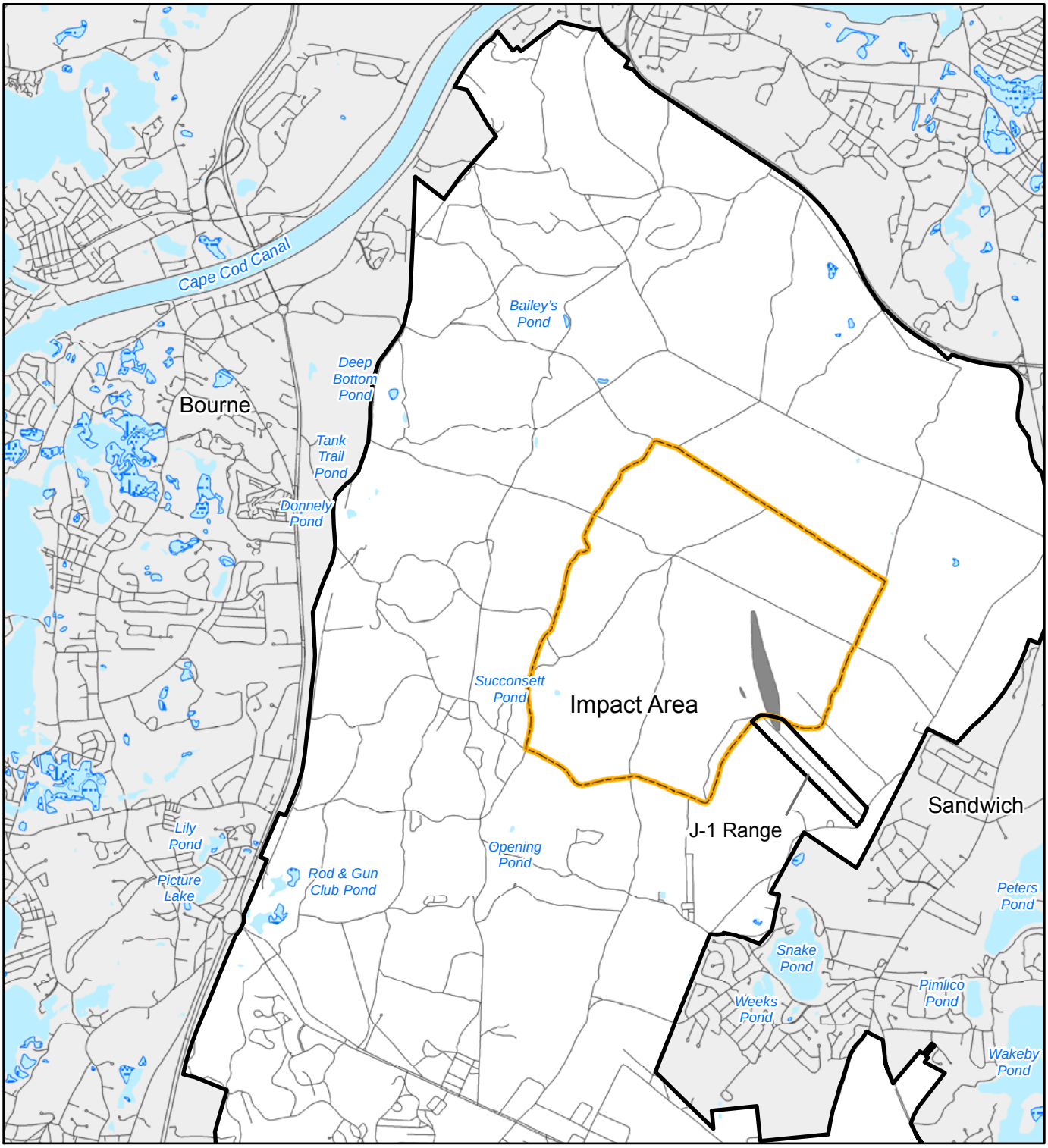
FIGURES



Location of J-1 Range Northern

FIGURE
1-1

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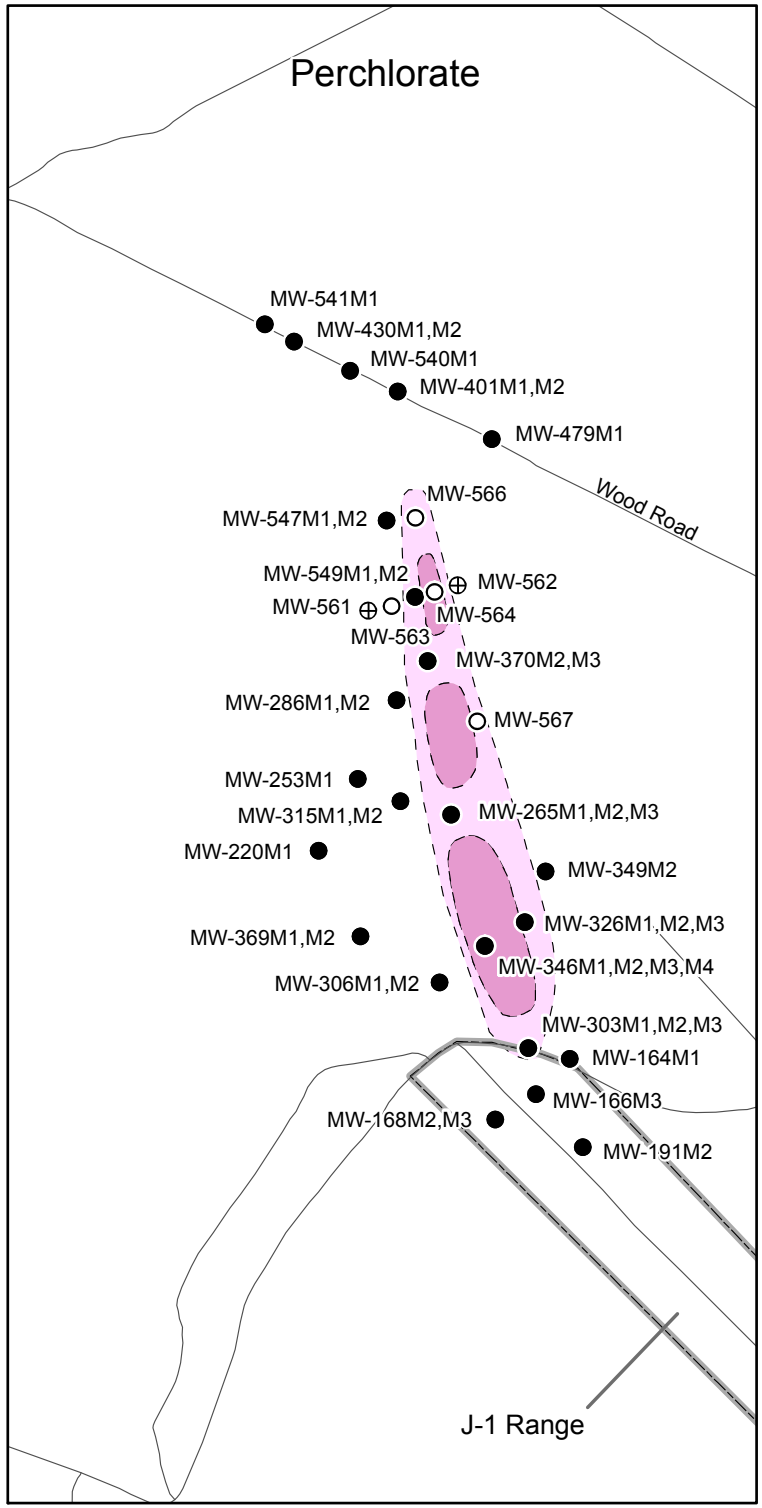
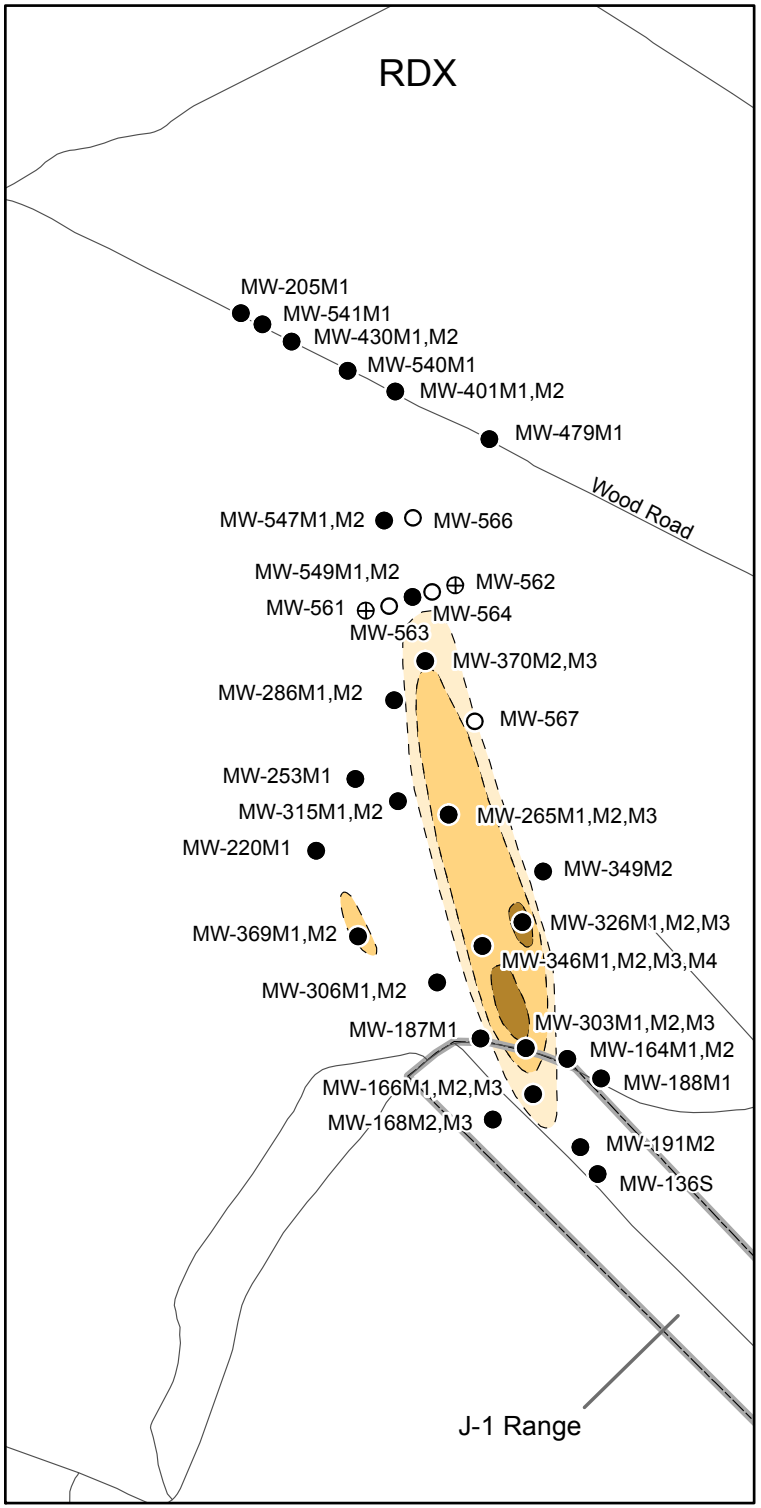
June 18, 2012 DWN: MTW CHKD: CJK

Impact Area
Groundwater Study Program





Impact Area Groundwater Study Program

LEGEND

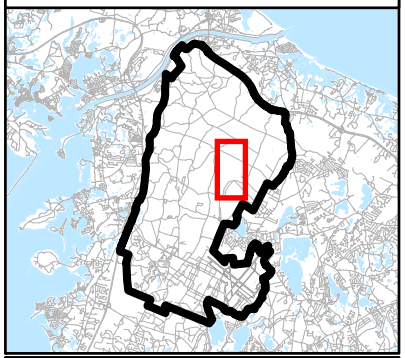
- Monitoring Well
- New Monitoring Wells (not currently in monitoring network)
- Boring Profiles
- J-1 Range Boundary
- MMR Boundary

Perchlorate Detections
- 2-15 µg/L
- 15-200 µg/L

RDX Detections
- 0.6-2 µg/L
- 2-20 µg/L
- 20-200 µg/L

Plumes reflect water quality data through November 2011

LOCATION MAP



NOTES & SOURCES

Map Coordinate System: NAD83 UTM Zone 19N Meters
Basemap data from US Geological Survey 7 1/2 minute
Topographic Maps: Source: MassGIS

TITLE

J-1 Range Northern Chemical Monitoring Network

0 1,250 Feet

N

US Army Corps of Engineers
New England District

FIGURE 2-1

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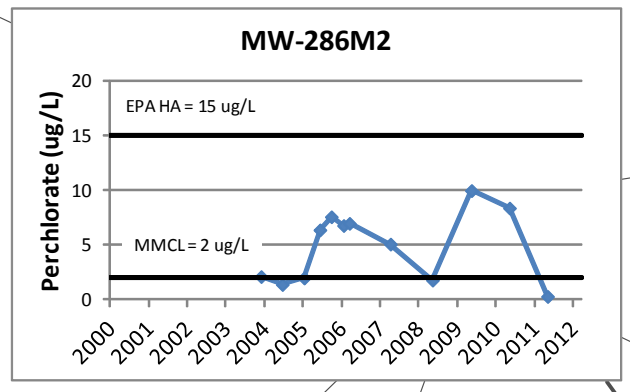
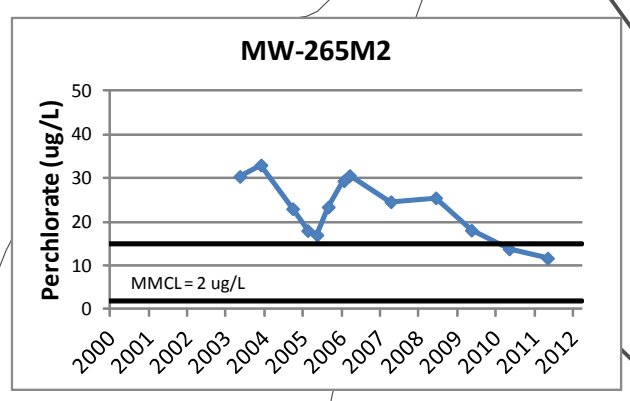
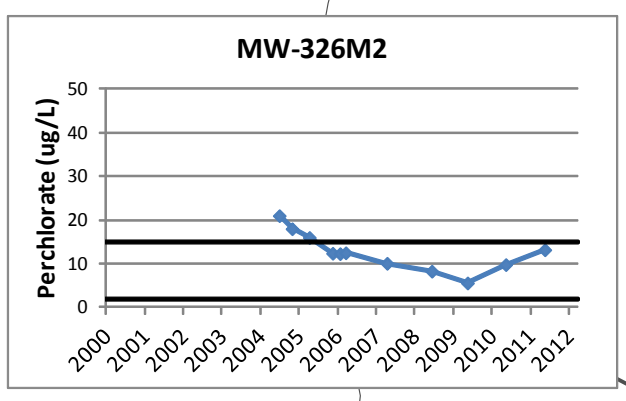
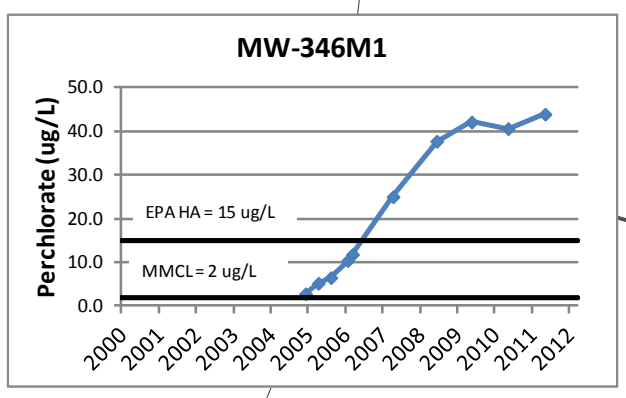
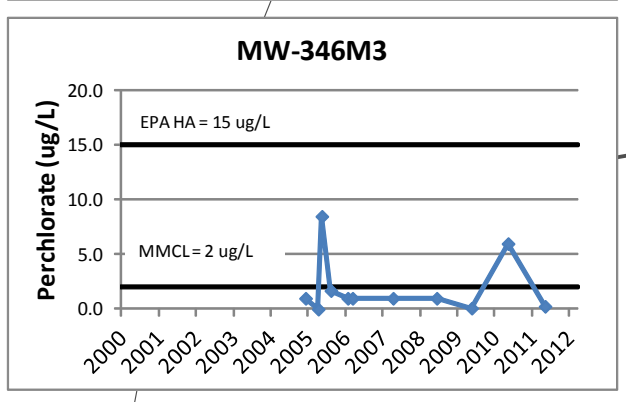
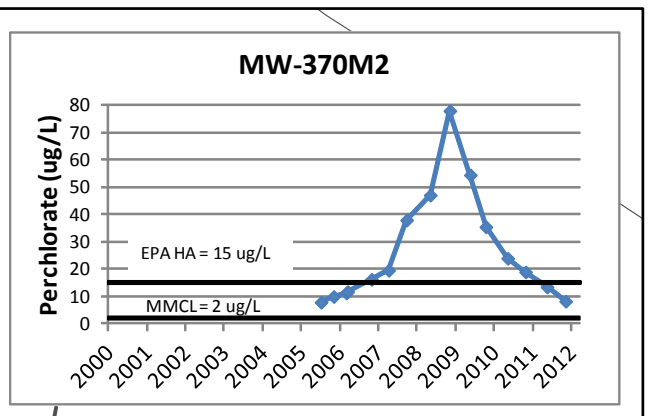


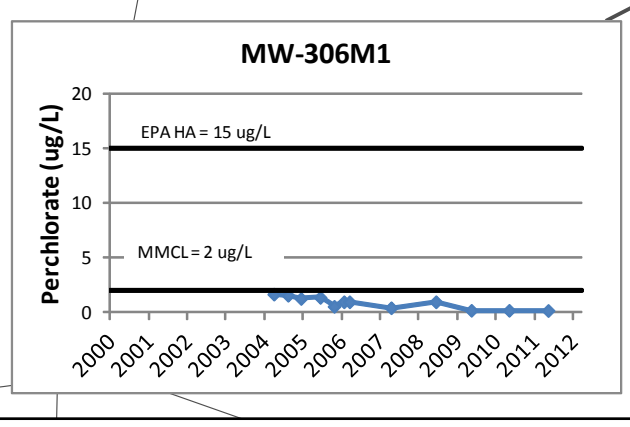


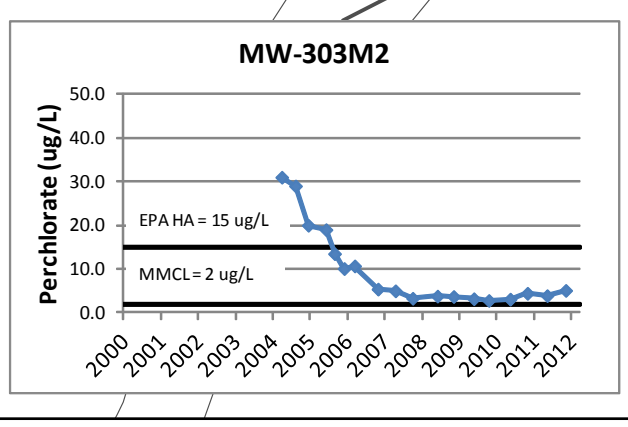


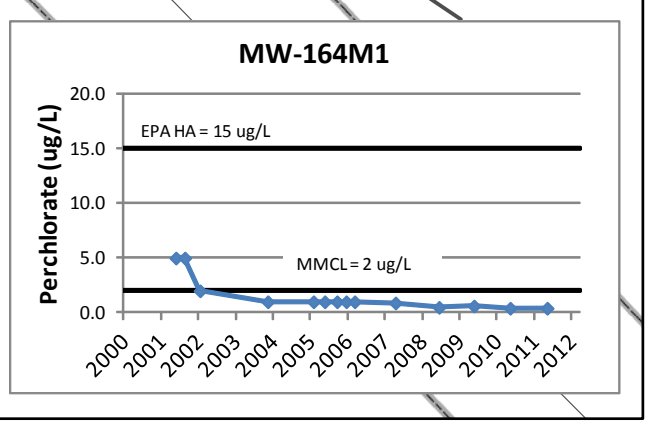


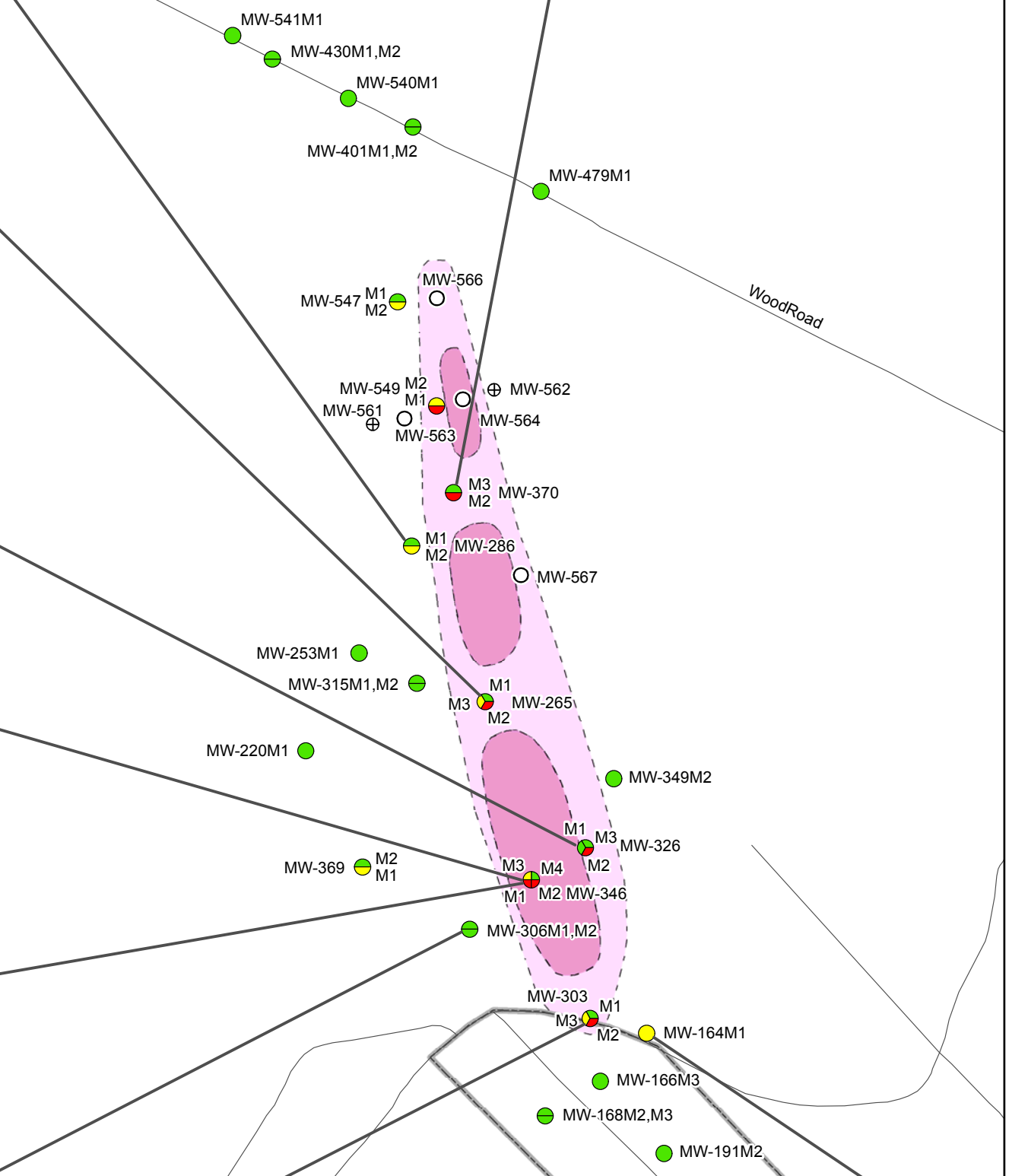












LEGEND

Perchlorate Detections

- 2-15 µg/L
- 15-200 µg/L

Plumes reflect water quality data through November 2011

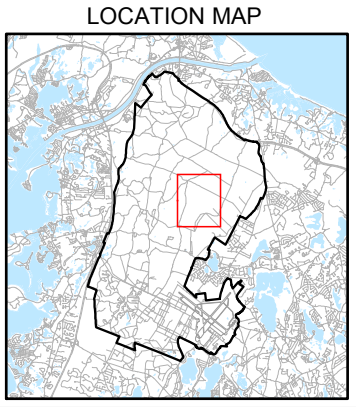
- J-1 Range Boundary
- MMR Boundary

Perchlorate Detections in Groundwater

- No Detection
- Detection at or below 2 µg/L
- Detection above 2 µg/L
- M1 M2 Multiple screen Well Locations
- New Monitoring Wells (not currently in monitoring network)
- Boring Profiles

Note:
Color coding for wells is based on highest values reported in 2011.

LOCATION MAP



N

0 700 Feet

NOTES & SOURCES
Base Data from US Geological Survey
7 1/2 minute Topgraphic Maps
Source: MassGIS

US Army Corps of Engineers
New England District

Impact Area Groundwater Study Program

J-1 Range Northern Perchlorate in Groundwater

FIGURE 3-1

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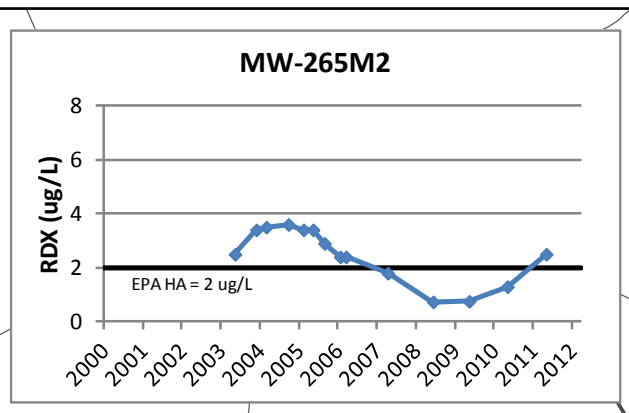

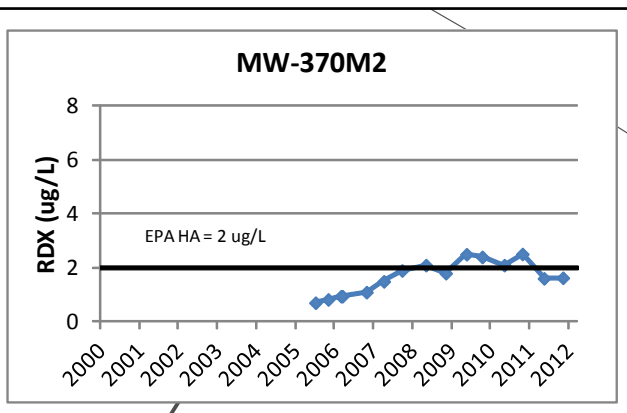

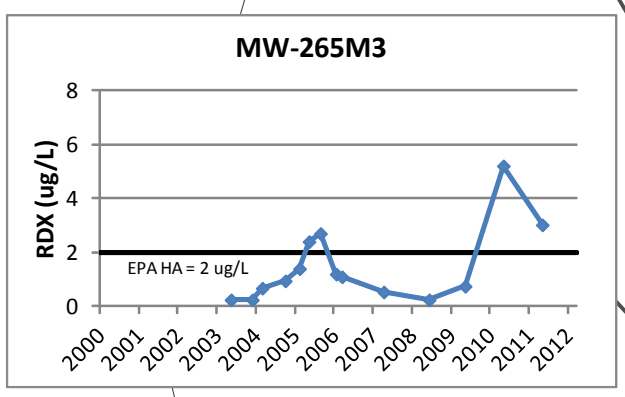

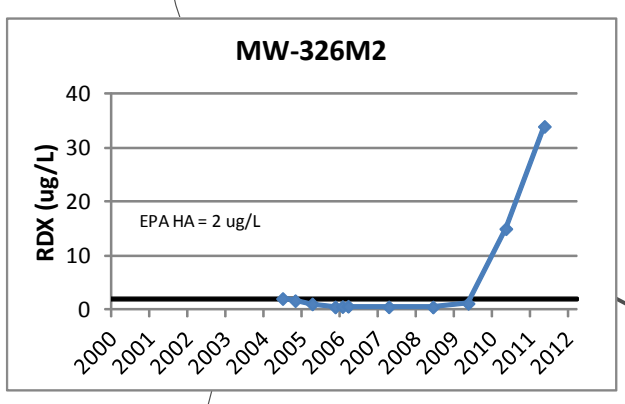

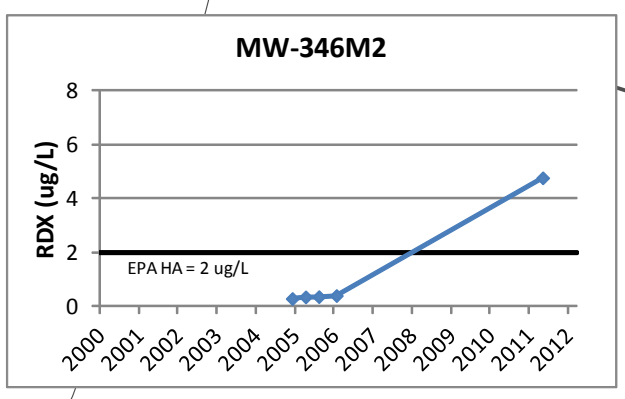

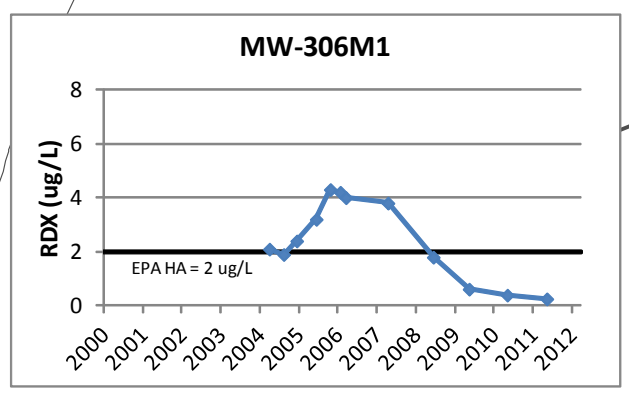

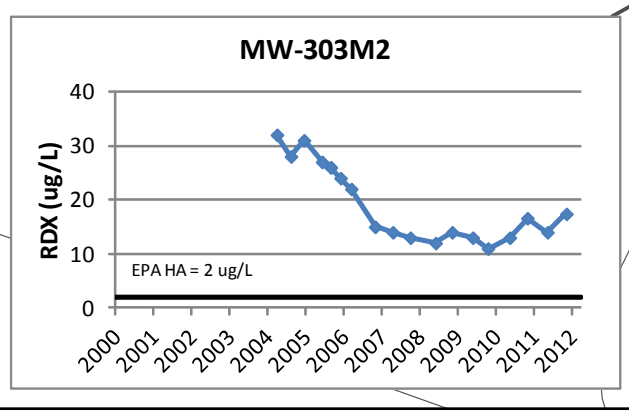

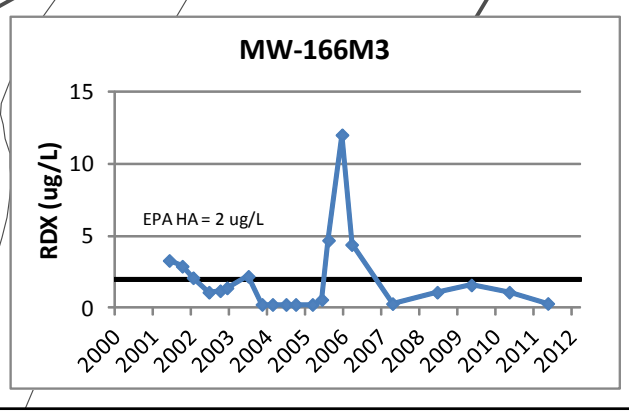

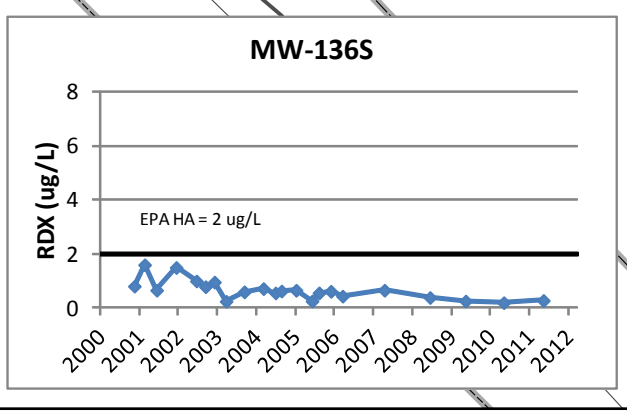

MW-205M1
MW-541M1
MW-430M1,M2
MW-540M1
MW-401M1,M2
MW-479M1
WoodRoad
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MW-566
MW-562
MW-549
M2
M1
MW-561
MW-564
MW-563
M3
M2
MW-370
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MW-315M1,M2
M1
M2
MW-265
M3
MW-220M1
MW-349M2
M3
MW-326
M1
M2
M2
M1
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M3
M4
MW-346
M1
M2
M2
MW-306
M1
MW-187M1
M1
MW-303
M2
M3
MW-164M1,M2
MW-188M1
M2
M1
MW-166
M3
MW-168M2,M3
MW-191M2
MW-136S

LEGEND

RDX Detections

- 0.6-2 µg/L
- 2-20 µg/L
- 20-200 µg/L

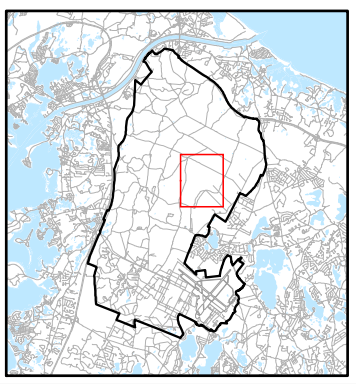
Plumes reflect water quality data through November 2011

- J-1 Range Boundary
- MMR Boundary

RDX Detections in Groundwater

- No Detection
- Detection at or below 0.6 µg/L
- Detection above 0.6 µg/L
- M1 / M2 Multiple screen Well Locations
- New Monitoring Wells (not currently in monitoring network)
- Boring Profiles

Note:
Color coding for wells is based on highest values reported in 2011.



N

0 700 Feet

NOTES & SOURCES
Base Data from US Geological Survey
7 1/2 minute Topgraphic Maps
Source: MassGIS

US Army Corps of Engineers
New England District

Impact Area Groundwater Study Program

J-1 Range Northern RDX in Groundwater

FIGURE
3-2

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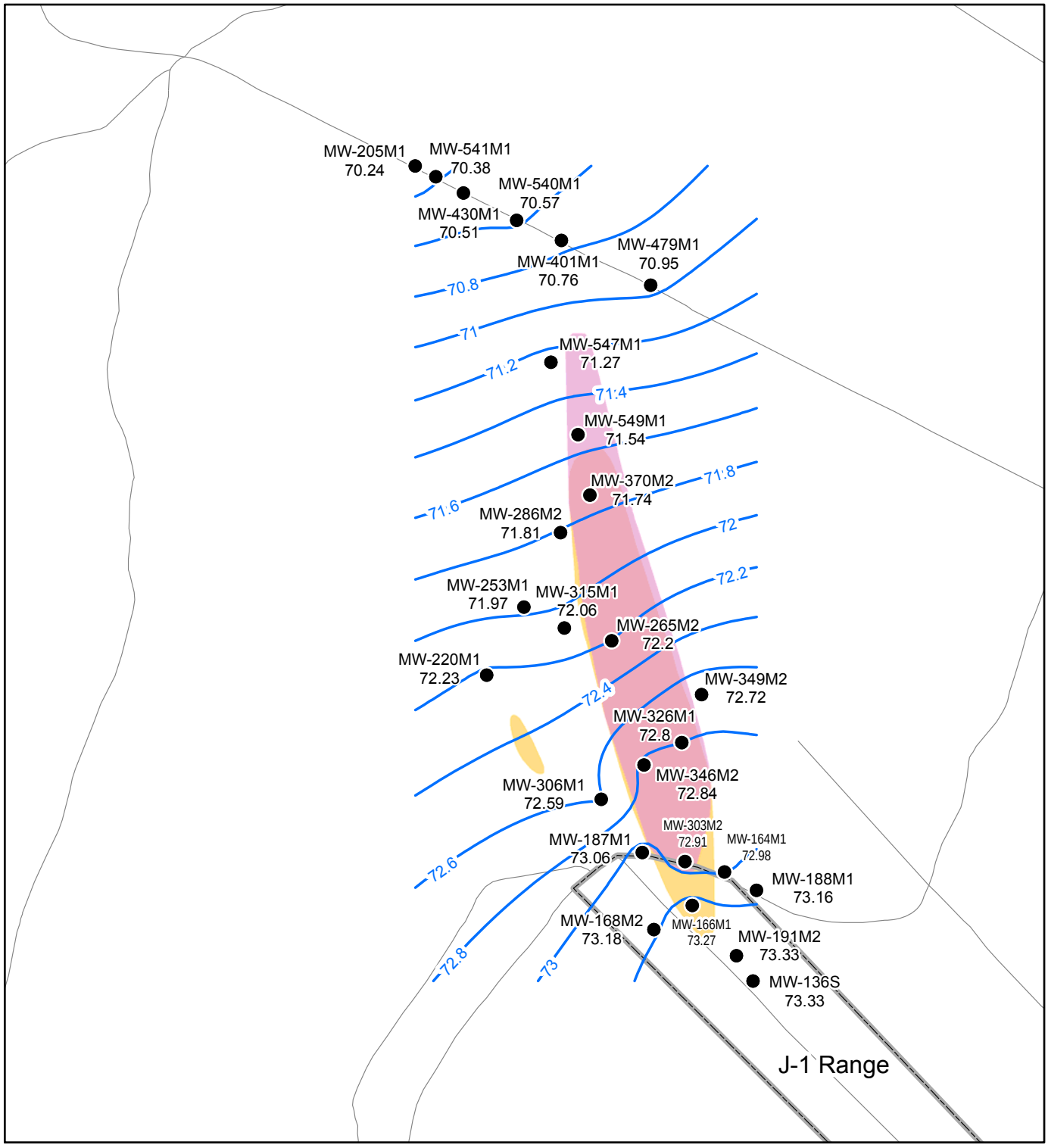
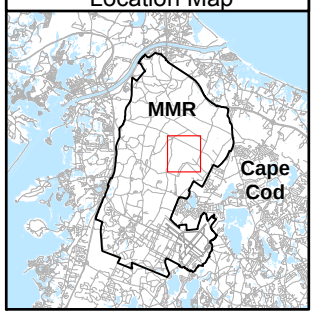


Legend

- Monitoring Well
- 72.4 Potentiometric Contours, 0.2 foot mean sea level intervals
- Perchlorate Plume (shown to 2 µg/L)
- RDX Plume (shown to 0.6 µg/L)

Plumes reflect water quality data through November 2011

Location Map



N

0 1,000 Feet

TITLE

J-1 Range Northern Groundwater Potentiometric Map for May 2011

US Army Corps of Engineers
New England District

Impact Area Groundwater Study Program

FIGURE 3-3

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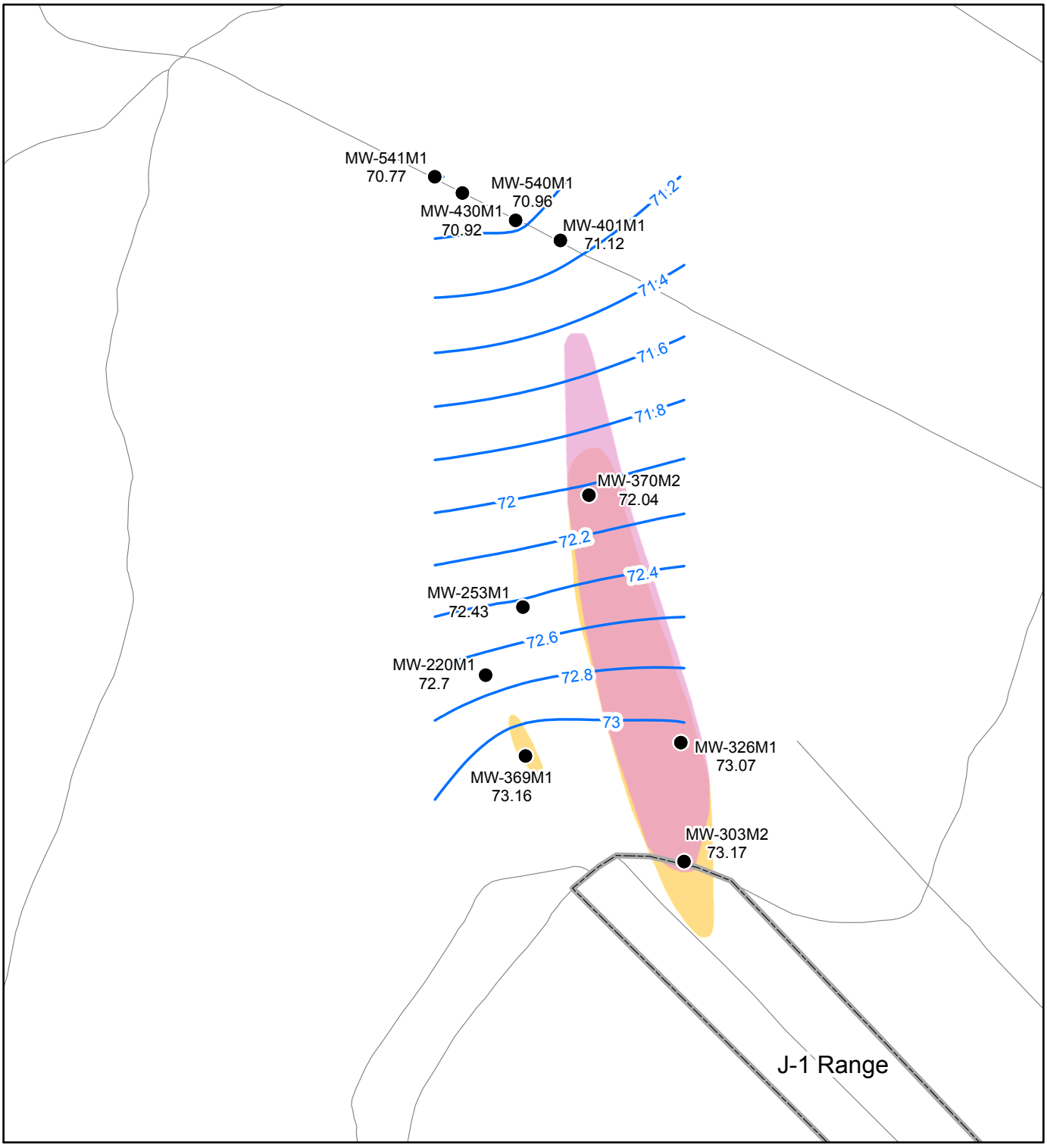
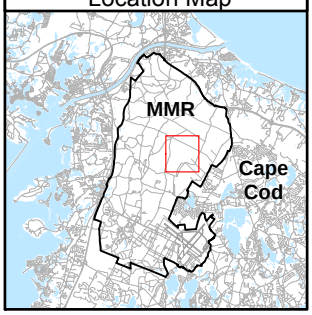


Legend

- Monitoring Well
- 72.8 — Potentiometric Contours, 0.2 foot mean sea level intervals
- Perchlorate Plume (shown to 2 µg/L)
- RDX Plume (shown to 0.6 µg/L)

Plumes reflect water quality data through November 2011

Location Map



N

0 1,000 Feet

TITLE

J-1 Range Northern
Groundwater Potentiometric Map
for November 2011

US Army Corps of Engineers
New England District

Impact Area Groundwater Study Program

FIGURE 3-4

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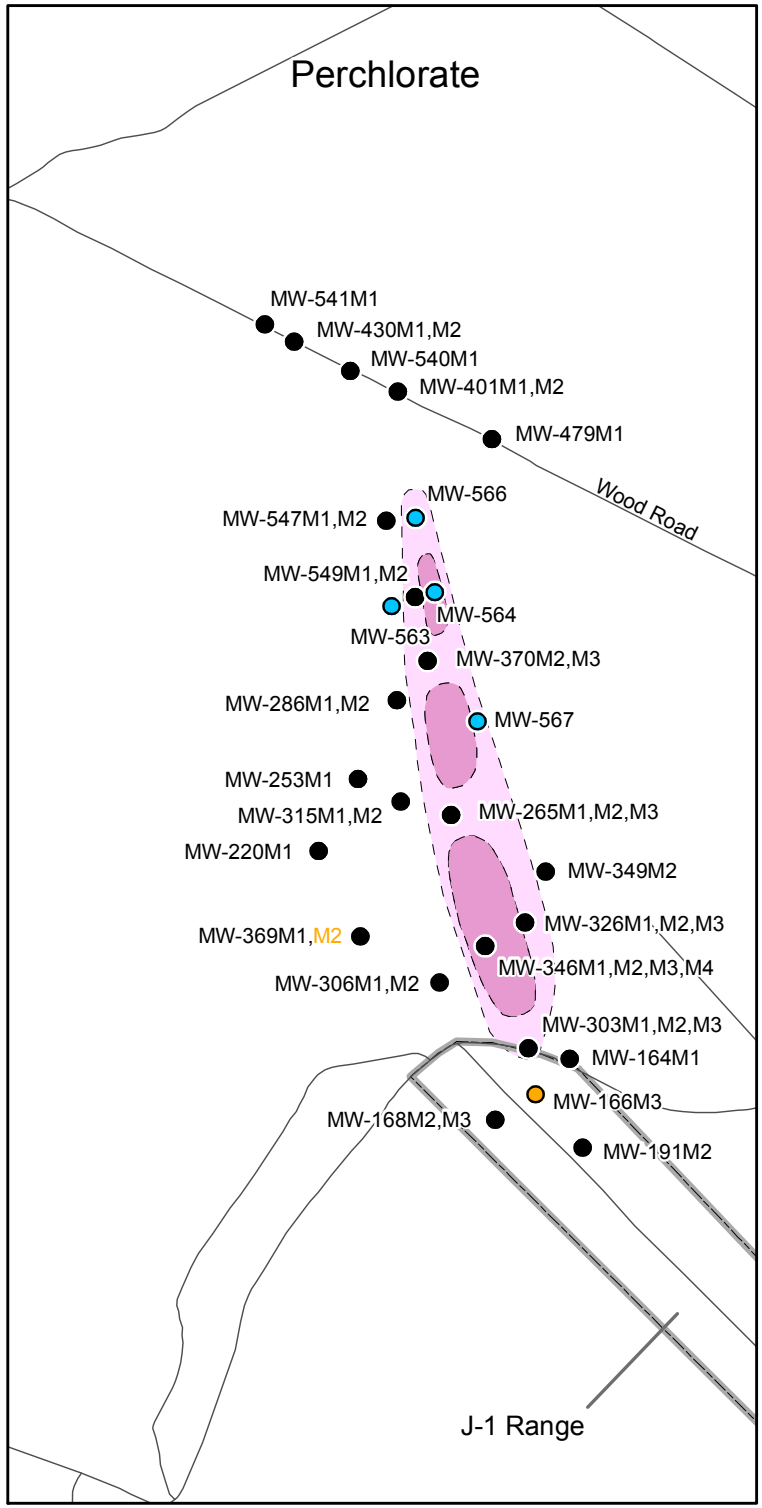
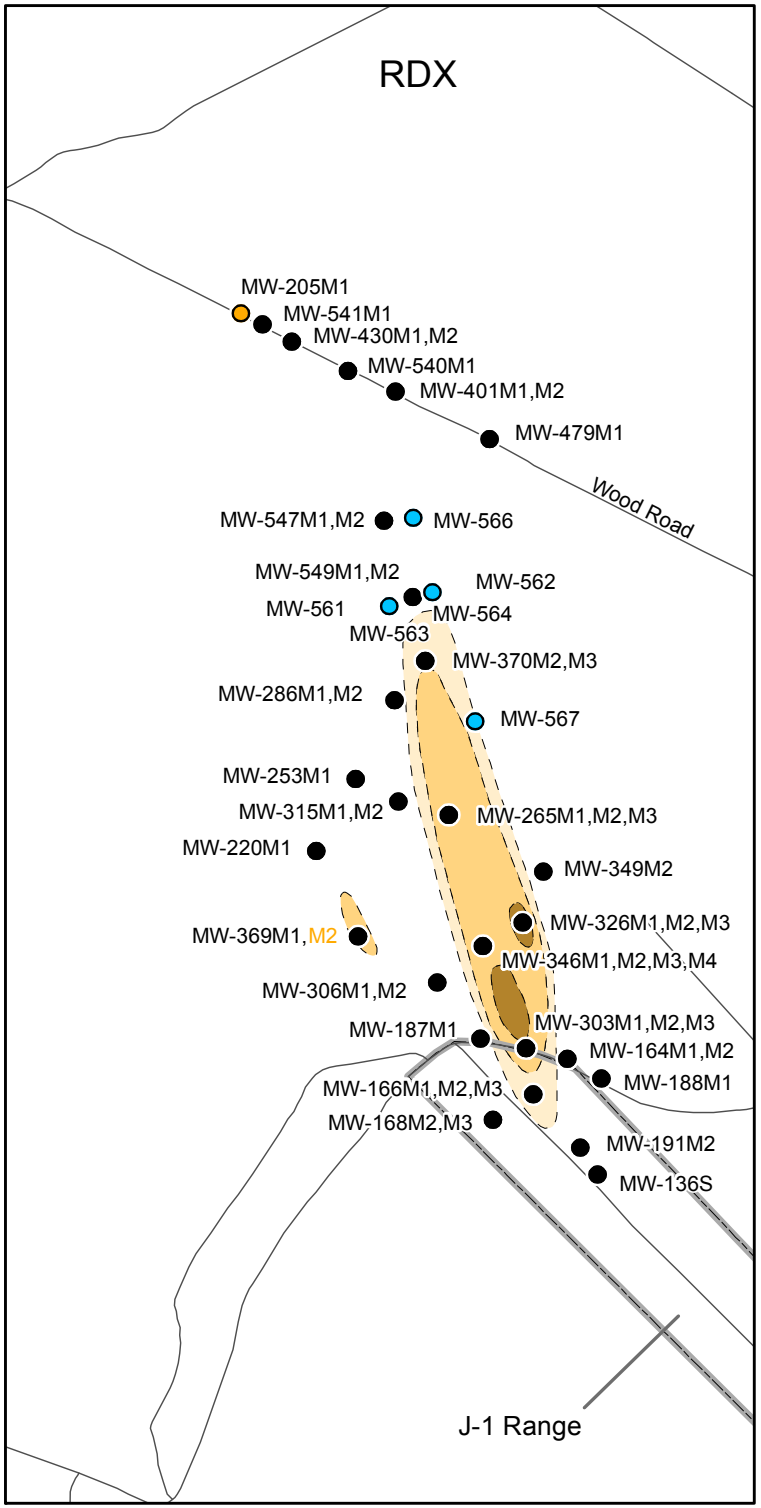




Impact Area Groundwater Study Program

LEGEND

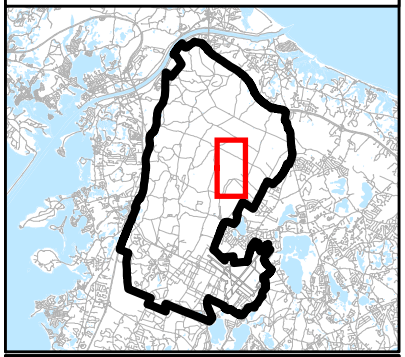
- Monitoring Well in the Network
- Monitoring Well Proposed to be Added to the Network
- Monitoring Well Proposed to be Removed from the Network
- M2 Monitoring Well Screen Proposed to be Removed from the Network
- J-1 Range Boundary
- MMR Boundary

Perchlorate Detections
- 2-15 µg/L
- 15-200 µg/L

RDX Detections
- 0.6-2 µg/L
- 2-20 µg/L
- 20-200 µg/L

Plumes reflect water quality data through November 2011

LOCATION MAP



NOTES & SOURCES

Map Coordinate System: NAD83 UTM Zone 19N Meters
Basemap data from US Geological Survey 7 1/2 minute
Topographic Maps: Source: MassGIS

TITLE

Proposed J-1 Range Northern Interim Groundwater Chemical Monitoring Network

0 1,250 Feet

N

US Army Corps of Engineers
New England District

FIGURE 4-1

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November 16, 2012 DWN: MTW CHKD: CJK

TABLES

Table 2-1
J-1 Range Northern Interim Groundwater Chemical Monitoring Network for 2011

Location	Northing (m)	Easting (m)	Surface Elevation (ft msl)	Screen Interval (ft msl)	2011 Rationale for Location	2011 Sampling Frequency (a)	2011 Sample Parameters(b)
MW-136S	4,617,969	373,364	177.88	70.88 to 60.88	Monitor the trailing edge and source of the RDX and HMX plumes.	A	Explosives
MW-164M1	4,618,198	373,304	180.32	-46.68 to -56.68	Monitor the lower eastern boundary of the RDX and HMX plumes.	A	Explosives, Perchlorate
MW-164M2	4,618,198	373,304	180.32	23.32 to 13.32	Monitor adjacent to the core of the RDX and HMX plumes.	A	Explosives
MW-166M1	4,618,128	373,236	177.93	-40.07 to -45.07	Monitor the lower boundary of the RDX plume.	A	Explosives
MW-166M2	4,618,128	373,236	177.93	27.93 to 17.93	Monitor the core of the RDX and HMX plumes.	A	Explosives
MW-166M3	4,618,128	373,236	177.93	52.93 to 42.93	Monitor the upper boundary of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate
MW-168M2	4,618,077	373,155	154.14	-43.86 to -53.86	Monitor the lower western boundary of the RDX and perchlorate plumes to confirm flow path from source area.	A	Explosives, Perchlorate
MW-168M3	4,618,078	373,155	154.14	51.14 to 41.14	Monitor the western boundary of the RDX and HMX plumes to confirm flow path from the source area.	A	Explosives, Perchlorate
MW-187D	4,618,238	373,131	174.46	-131.54 to -141.54	Benzene and other fuel-related constituents have historically exceeded their respective MCLs.	A	VOCs, SVOCs
MW-187M1	4,618,239	373,131	174.46	14.46 to 4.46	Monitor the western boundary of the RDX and HMX plumes.	A	Explosives
MW-188M1	4,618,159	373,371	179.41	24.41 to 14.41	Monitor the eastern boundary of the RDX and HMX plumes.	A	Explosives
MW-191M2	4,618,022	373,329	179.62	59.62 to 49.62	Monitor the trailing edge and source of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate
MW-205M1	4,619,678	372,655	162.76	-4.24 to -14.24	Monitor the most downgradient RDX detection.	A	Explosives
MW-220M1	4,618,611	372,805	192.15	-55.85 to -65.85	Monitor the western boundary of the RDX and perchlorate plumes.	S	Explosives, Perchlorate
MW-253M1	4,618,754	372,883	192.96	-72.04 to -82.04	Monitor the western/leading edge of the RDX and perchlorate plumes.	S	Explosives, Perchlorate
MW-265M1	4,618,690	373,068	192.23	-72.77 to -82.77	Monitor the lower boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate
MW-265M2	4,618,690	373,068	192.23	-32.77 to -42.77	Monitor the core of the RDX and perchlorate plumes.	A	Explosives, Perchlorate
MW-265M3	4,618,690	373,068	192.23	-7.77 to -17.77	Monitor the upper boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate
MW-286M1	4,618,910	372,960	196	-63 to -73	Monitor the lower boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate

Table 2-1
J-1 Range Northern Interim Groundwater Chemical Monitoring Network for 2011

Location	Northing (m)	Easting (m)	Surface Elevation (ft msl)	Screen Interval (ft msl)	2011 Rationale for Location	2011 Sampling Frequency (a)	2011 Sample Parameters(b)
MW-286M2	4,618,910	372,960	196	-9 to -19	Monitor the leading edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate
MW-303M1	4,618,220	373,221	180.79	-118.28 to -128.28	Monitor the lower boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate
MW-303M2	4,618,220	373,221	180.79	-54.3 to -64.31	Monitor the core of the RDX, HMX, and perchlorate plumes to understand the dynamics of the higher concentrations within the plume.	S	Explosives, Perchlorate
MW-303M3	4,618,220	373,221	180.79	41.05 to 31.1	Monitor the core of the RDX, HMX, and perchlorate plumes to understand the dynamics of the higher concentrations within the plume.	S	Explosives, Perchlorate
MW-306D	4,618,350	373,045	185.67	-105.99 to -115.99	Benzene and other fuel-related constituents have historically exceeded their respective MCLs.	A	VOCs, SVOCs
MW-306M1	4,618,350	373,045	185.67	0.79 to -9.21	Monitor the western boundary of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate
MW-306M2	4,618,350	373,045	185.67	20.98 to 10.98	Monitor the western boundary of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate
MW-315M1	4,618,709	372,968	190.22	-55.27 to -65.27	Monitor the western edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate
MW-315M2	4,618,709	372,968	190.22	-5.48 to -15.48	Monitor the western edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate
MW-326M1	4,618,469	373,214	186.35	-63.66 to -73.66	Monitor the lower boundary of the RDX and perchlorate plumes to confirm plume extent.	S	Explosives, Perchlorate
MW-326M2	4,618,469	373,214	186.35	-9.92 to -19.93	Monitor the core of the RDX, and perchlorate plumes.	A	Explosives, Perchlorate
MW-326M3	4,618,469	373,214	186.35	21.11 to 11.09	Monitor the upper boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate
MW-346M1	4,618,422	373,135	180.79	-63.9 to -73.9	Monitor the lower boundary of the perchlorate and RDX plumes.	A	Explosives, Perchlorate
MW-346M2	4,618,422	373,135	180.79	-24.51 to -34.51	Monitor the lower boundary of the perchlorate and RDX plumes.	A	Explosives, Perchlorate
MW-346M3	4,618,423	373,135	180.79	5.52 to -4.48	Monitor the core of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate
MW-346M4	4,618,427	373,137	180.41	40.41 to 30.41	Monitor the upper boundary of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate
MW-349M2	4,618,570	373,256	187.69	-7.31 to -17.31	Monitor the eastern boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate
MW-369M1	4,618,451	372,893	184	-70.07 to -80.07	Monitor the western boundary of the RDX and perchlorate plumes.	S	Explosives, Perchlorate
MW-369M2	4,618,451	372,893	184	-32 to -42	Monitor the western boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate

Table 2-1
J-1 Range Northern Interim Groundwater Chemical Monitoring Network for 2011

Location	Northing (m)	Easting (m)	Surface Elevation (ft msl)	Screen Interval (ft msl)	2011 Rationale for Location	2011 Sampling Frequency (a)	2011 Sample Parameters(b)
MW-370M2	4,618,987	373,021	189	-26.54 to -36.54	Monitor the leading edge of the RDX and perchlorate plumes.	S	Explosives, Perchlorate
MW-370M3	4,618,987	373,021	189	14.04 to 4.04	Monitor the upper boundary of the leading edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate
MW-401M1	4,619,522	372,962	197.15	-58.95 to -68.95	Monitor the leading edge of the J-1 Northern plume to confirm contamination is upgradient of Wood Road.	A S	Explosives, Perchlorate
MW-401M2	4,619,522	372,962	197.15	56.09 to 46.09	Monitor the leading edge of the J-1 Northern plume to confirm contamination is upgradient of Wood Road.	A S	Explosives, Perchlorate
MW-430M1	4,619,621	372,757	174.05	-71.18 to -81.18	Monitor the leading edge of the J-1 Northern plume to confirm contamination is upgradient of Wood Road.	A S	Explosives, Perchlorate
MW-430M2	4,619,621	372,757	174.05	-14.36 to -24.36	Monitor the leading edge of the J-1 Northern plume to confirm contamination is upgradient of Wood Road.	A S	Explosives, Perchlorate
MW-479M1	4,619,428	373,149	188.84	-50.75 to -60.75	Monitor downgradient of the main J-1 Range Northern plume.	A	Explosives, Perchlorate
MW-540M1	4,619,563	372,864	193.39	59.06 to -69.06	Monitor the plume in the vicinity of Wood Road	A S	Explosives, Perchlorate
MW-541M1	4,619,656	372,699	164.24	-45.77 to -55.77	Monitor the plume in the vicinity of Wood Road	A S	Explosives, Perchlorate
MW-547M1	4,619,267	372,940	198.61	-38.39 to -48.39	Monitor the leading edge of the perchlorate and RDX plumes.	A	Explosives, Perchlorate
MW-547M2	4,619,267	372,939	198.61	20.61 to 10.61	Monitor the leading edge of the perchlorate and RDX plumes.	A	Explosives, Perchlorate
MW-549M1	4,619,115	372,997	196.00	-31.40 to -41.40	Monitor the leading edge of the perchlorate and RDX plumes.	S	Explosives, Perchlorate
MW-549M2	4,619,115	372,997	196.00	8.7 to -1.3	Monitor the leading edge of the perchlorate and RDX plumes.	S	Explosives, Perchlorate

Notes:

J-1 = J-1 Range
ft = feet
m = meters
msl = mean sea level
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine
HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
SVOC = semi-volatile organic compound
VOC = volatile organic compound

(a)
A = annually
S = semiannually
(b)
Explosives = EPA Method SW846/8330
Perchlorate = EPA Method E314.0 or SW6850
SVOCs = EPA Method 8270C
VOCs = EPA Method SW8260B

Table 3-1
J-1 Range Northern Groundwater Monitoring Well Results for 2011

Location	Sample Type	Analyte	Analyte Short Name	Test Method	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Top of Screen (ft msl)	Bottom of Screen (ft msl)	Groundwater Elevation (ft msl)	Date
MW-136S	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	0.28		0.20	70.88	60.88	73.33	05/19/2011
MW-136S	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	SW8330	8.5		0.20	70.88	60.88		05/19/2011
MW-136S	N1	ND for 17 Analytes	Explosives	SW8330	ND	U	ND	70.88	60.88		05/19/2011
MW-164M1	N1	Perchlorate	PCATE	SW6850	0.41		0.20	-46.68	-56.68	72.98	05/16/2011
MW-164M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-46.68	-56.68		05/16/2011
MW-164M2	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	23.32	13.32	73.04	05/16/2011
MW-166M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-40.07	-45.07	73.27	05/24/2011
MW-166M2	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	27.93	17.93	73.26	05/24/2011
MW-166M3	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	52.93	42.93	73.26	05/24/2011
MW-166M3	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	0.32		0.20	52.93	42.93		05/24/2011
MW-166M3	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	SW8330	0.27		0.20	52.93	42.93		05/24/2011
MW-166M3	N1	4-Amino-2,6-dinitrotoluene	A4DNT26	SW8330	0.98		0.20	52.93	42.93		05/24/2011
MW-166M3	N1	ND for 16 Analytes	Explosives	SW8330	ND	U	ND	52.93	42.93		05/24/2011
MW-168M2	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-43.86	-53.86	73.18	05/18/2011
MW-168M2	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-43.86	-53.86		05/18/2011
MW-168M3	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	51.14	41.14	73.30	05/18/2011
MW-168M3	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	51.14	41.14		05/18/2011
MW-187D	N1	2-Methylnaphthalene	SVOC	SW8270C	2.7	J	4.8	-131.54	-141.54	73.01	05/18/2011
MW-187D	N1	Fluorene	SVOC	SW8270C	0.89	J	4.8	-131.54	-141.54		05/18/2011
MW-187D	N1	Naphthalene	SVOC	SW8270C	3.7	J	4.8	-131.54	-141.54		05/18/2011
MW-187D	N1	Phenanthrene	SVOC	SW8270C	1.0	J	4.8	-131.54	-141.54		05/18/2011
MW-187D	N1	Toluene	VOC	SW8260B	0.61	J	1.0	-131.54	-141.54		05/18/2011
MW-187D	N1	Benzene	VOC	SW8260B	19.0		1.0	-131.54	-141.54		05/18/2011
MW-187D	N1	Ethylbenzene	VOC	SW8260B	2.3		1.0	-131.54	-141.54		05/18/2011
MW-187D	N1	M,P-Xylene (Sum of Isomers)	VOC	SW8260B	1.1		1.0	-131.54	-141.54		05/18/2011
MW-187D	N1	O-Xylene (1,2-Dimethylbenzene)	VOC	SW8260B	1.0		1.0	-131.54	-141.54		05/18/2011
MW-187D	N1	Xylenes, Total	VOC	SW8260B	2.1		1.0	-131.54	-141.54		05/18/2011
MW-187D	N1	ND for 41 Analytes	VOC	SW8260B	ND	U	ND	-131.54	-141.54		05/18/2011
MW-187D	N1	ND for 74 Analytes	SVOC	SW8270C	ND	U	ND	-131.54	-141.54		05/18/2011
MW-187D	N1	ND for 41 Analytes	VOC	SW8260B	ND	UJ	ND	-131.54	-141.54		05/18/2011
MW-187D	N1	ND for 74 Analytes	SVOC	SW8270C	ND	UJ	ND	-131.54	-141.54		05/18/2011
MW-187D	N1	ND for 74 Analytes	SVOC	SW8270C	ND	R	ND	-131.54	-141.54		05/18/2011
MW-187M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	14.46	4.46	73.06	05/18/2011
MW-188M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	24.41	14.41	73.16	05/16/2011
MW-191M2	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	59.62	49.62	73.33	05/19/2011
MW-191M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	0.20		0.20	59.62	49.62		05/19/2011
MW-191M2	N1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	59.62	49.62		05/19/2011
MW-205M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-4.24	-14.24	70.24	05/23/2011

Table 3-1
J-1 Range Northern Groundwater Monitoring Well Results for 2011

Location	Sample Type	Analyte	Analyte Short Name	Test Method	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Top of Screen (ft msl)	Bottom of Screen (ft msl)	Groundwater Elevation (ft msl)	Date
MW-220M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-55.85	-65.85	72.70	11/18/2011
MW-220M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-55.85	-65.85		11/18/2011
MW-220M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-55.85	-65.85	72.23	05/13/2011
MW-220M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-55.85	-65.85		05/13/2011
MW-253M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-72.04	-82.04	72.43	11/18/2011
MW-253M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-72.04	-82.04		11/18/2011
MW-253M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-72.04	-82.04	71.97	05/13/2011
MW-253M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-72.04	-82.04		05/13/2011
MW-265M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-71.93	-81.93	72.20	05/13/2011
MW-265M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-71.93	-81.93		05/13/2011
MW-265M2	N1	Perchlorate	PCATE	SW6850	11.7		0.40	-31.93	-41.93	72.20	05/13/2011
MW-265M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	2.5		0.20	-31.93	-41.93		05/13/2011
MW-265M2	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	SW8330	0.33		0.20	-31.93	-41.93		05/13/2011
MW-265M2	N1	ND for 17 Analytes	Explosives	SW8330	ND	U	ND	-31.93	-41.93		05/13/2011
MW-265M2	FD1	Perchlorate	PCATE	SW6850	11.3		0.40	-31.93	-41.93		05/13/2011
MW-265M3	N1	Perchlorate	PCATE	SW6850	0.46		0.20	-6.93	-16.93	72.19	05/13/2011
MW-265M3	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	3.0		0.20	-6.93	-16.93		05/13/2011
MW-265M3	N1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	-6.93	-16.93		05/13/2011
MW-286M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-66.85	-76.85	71.83	05/13/2011
MW-286M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-66.85	-76.85		05/13/2011
MW-286M2	N1	Perchlorate	PCATE	SW6850	0.31		0.20	-12.85	-22.85	71.81	05/13/2011
MW-286M2	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-12.85	-22.85		05/13/2011
MW-303M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-118.21	-128.21	72.89	05/16/2011
MW-303M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	0.28		0.20	-118.21	-128.21		05/16/2011
MW-303M1	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	SW8330	0.44		0.20	-118.21	-128.21		05/16/2011
MW-303M1	N1	ND for 17 Analytes	Explosives	SW8330	ND	U	ND	-118.21	-128.21		05/16/2011
MW-303M2	N1	Perchlorate	PCATE	SW6850	5.1		0.20	-54.21	-64.21	73.17	11/15/2011
MW-303M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	17.4		0.20	-54.21	-64.21		11/15/2011
MW-303M2	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	SW8330	4.7		0.20	-54.21	-64.21		11/15/2011
MW-303M2	N1	ND for 17 Analytes	Explosives	SW8330	ND	U	ND	-54.21	-64.21		11/15/2011
MW-303M2	FD1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	17.5		0.20	-54.21	-64.21		11/15/2011
MW-303M2	FD1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	SW8330	4.8		0.20	-54.21	-64.21		11/15/2011
MW-303M2	FD1	ND for 17 Analytes	Explosives	SW8330	ND	U	ND	-54.21	-64.21		11/15/2011
MW-303M2	N1	Perchlorate	PCATE	SW6850	3.9		0.20	-54.21	-64.21	72.91	05/16/2011
MW-303M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	14.0		0.20	-54.21	-64.21		05/16/2011
MW-303M2	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	SW8330	2.6		0.20	-54.21	-64.21		05/16/2011
MW-303M2	N1	ND for 17 Analytes	Explosives	SW8330	ND	U	ND	-54.21	-64.21		05/16/2011
MW-303M2	FD1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	14.1		0.20	-54.21	-64.21		05/16/2011
MW-303M2	FD1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	SW8330	2.6		0.20	-54.21	-64.21		05/16/2011
MW-303M2	FD1	ND for 17 Analytes	Explosives	SW8330	ND	U	ND	-54.21	-64.21		05/16/2011

Table 3-1
J-1 Range Northern Groundwater Monitoring Well Results for 2011

Location	Sample Type	Analyte	Analyte Short Name	Test Method	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Top of Screen (ft msl)	Bottom of Screen (ft msl)	Groundwater Elevation (ft msl)	Date
MW-303M3	N1	Perchlorate	PCATE	SW6850	0.099	J	0.20	40.79	30.79	73.24	11/15/2011
MW-303M3	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	1.3		0.20	40.79	30.79		11/15/2011
MW-303M3	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	SW8330	1.3		0.20	40.79	30.79		11/15/2011
MW-303M3	N1	4-Amino-2,6-dinitrotoluene	A4DNT26	SW8330	0.86		0.20	40.79	30.79		11/15/2011
MW-303M3	N1	ND for 16 Analytes	Explosives	SW8330	ND	U	ND	40.79	30.79		11/15/2011
MW-303M3	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	40.79	30.79	72.92	05/16/2011
MW-303M3	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	1.6		0.20	40.79	30.79		05/16/2011
MW-303M3	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	SW8330	1.6		0.20	40.79	30.79		05/16/2011
MW-303M3	N1	4-Amino-2,6-dinitrotoluene	A4DNT26	SW8330	0.72		0.20	40.79	30.79		05/16/2011
MW-303M3	N1	ND for 16 Analytes	Explosives	SW8330	ND	U	ND	40.79	30.79		05/16/2011
MW-303M3	FD1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	1.6		0.20	40.79	30.79		05/16/2011
MW-303M3	FD1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	SW8330	1.6		0.20	40.79	30.79		05/16/2011
MW-303M3	FD1	4-Amino-2,6-dinitrotoluene	A4DNT26	SW8330	0.72		0.20	40.79	30.79		05/16/2011
MW-303M3	FD1	ND for 16 Analytes	Explosives	SW8330	ND	U	ND	40.79	30.79		05/16/2011
MW-306D	N1	Chloroform	TCLME	SW8260B	0.46	J	1.0	-106.33	-116.33	72.60	05/18/2011
MW-306D	N1	ND for 46 Analytes	VOC	SW8260B	ND	U	ND	-106.33	-116.33		05/18/2011
MW-306D	N1	ND for 78 Analytes	SVOC	SW8270C	ND	U	ND	-106.33	-116.33		05/18/2011
MW-306D	N1	ND for 46 Analytes	VOC	SW8260B	ND	UJ	ND	-106.33	-116.33		05/18/2011
MW-306D	N1	ND for 78 Analytes	SVOC	SW8270C	ND	UJ	ND	-106.33	-116.33		05/18/2011
MW-306D	N1	ND for 78 Analytes	SVOC	SW8270C	ND	R	ND	-106.33	-116.33		05/18/2011
MW-306M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	0.67	-9.33	72.59	05/18/2011
MW-306M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	0.26		0.20	0.67	-9.33		05/18/2011
MW-306M1	N1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	0.67	-9.33		05/18/2011
MW-306M2	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	20.67	10.67	72.74	05/25/2011
MW-306M2	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	20.67	10.67		05/25/2011
MW-315M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-54.78	-64.78	72.06	05/20/2011
MW-315M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-54.78	-64.78		05/20/2011
MW-315M2	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-5.48	-15.48	72.05	05/20/2011
MW-315M2	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-5.48	-15.48		05/20/2011
MW-326M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-63.65	-73.65	73.07	11/15/2011
MW-326M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-63.65	-73.65		11/15/2011
MW-326M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-63.65	-73.65	72.80	05/25/2011
MW-326M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-63.65	-73.65		05/25/2011
MW-326M2	N1	Perchlorate	PCATE	SW6850	13.2		0.40	-9.65	-19.65	72.78	05/25/2011
MW-326M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	33.9		0.40	-9.65	-19.65		05/25/2011
MW-326M2	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	SW8330	3.6		0.20	-9.65	-19.65		05/25/2011
MW-326M2	N1	ND for 17 Analytes	Explosives	SW8330	ND	U	ND	-9.65	-19.65		05/25/2011
MW-326M2	FD1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	34.6		0.40	-9.65	-19.65		05/25/2011
MW-326M2	FD1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	SW8330	3.6		0.20	-9.65	-19.65		05/25/2011
MW-326M2	FD1	ND for 17 Analytes	Explosives	SW8330	ND	U	ND	-9.65	-19.65		05/25/2011

Table 3-1
J-1 Range Northern Groundwater Monitoring Well Results for 2011

Location	Sample Type	Analyte	Analyte Short Name	Test Method	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Top of Screen (ft msl)	Bottom of Screen (ft msl)	Groundwater Elevation (ft msl)	Date
MW-326M3	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	21.35	11.35	72.84	05/25/2011
MW-326M3	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	21.35	11.35		05/25/2011
MW-346M1	N1	Perchlorate	PCATE	SW6850	43.9		1.0	-64.21	-74.21	72.82	05/17/2011
MW-346M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	0.97		0.20	-64.21	-74.21		05/17/2011
MW-346M1	N1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	-64.21	-74.21		05/17/2011
MW-346M1	FD1	Perchlorate	PCATE	SW6850	44.4		1.0	-64.21	-74.21		05/17/2011
MW-346M1	LR1	Perchlorate	PCATE	SW6860	45.6		5.0	-64.21	-74.21		05/17/2011
MW-346M2	N1	Perchlorate	PCATE	SW6850	15.8		0.40	-24.51	-34.51	72.84	05/17/2011
MW-346M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	4.8		0.20	-24.51	-34.51		05/17/2011
MW-346M2	N1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	-24.51	-34.51		05/17/2011
MW-346M2	FD1	Perchlorate	PCATE	SW6850	15.7		0.40	-24.51	-34.51		05/17/2011
MW-346M3	N1	Perchlorate	PCATE	SW6850	0.26		0.20	5.79	-4.21	73.20	05/17/2011
MW-346M3	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	0.29		0.20	5.79	-4.21		05/17/2011
MW-346M3	N1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	5.79	-4.21		05/17/2011
MW-346M3	FD1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	0.20		0.20	5.79	-4.21		05/17/2011
MW-346M3	FD1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	5.79	-4.21		05/17/2011
MW-346M4	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	40.41	30.41	72.84	05/17/2011
MW-346M4	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	40.41	30.41		05/17/2011
MW-349M2	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-7.31	-17.31	72.72	05/24/2011
MW-349M2	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-7.31	-17.31		05/24/2011
MW-369M1	N1	Perchlorate	PCATE	SW6850	1.1		0.20	-70.15	-80.15	73.16	11/18/2011
MW-369M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	2.3		0.20	-70.15	-80.15		11/18/2011
MW-369M1	N1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	-70.15	-80.15		11/18/2011
MW-369M1	N1	Perchlorate	PCATE	SW6850	1.1		0.20	-70.15	-80.15	72.83	05/16/2011
MW-369M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	2.0		0.20	-70.15	-80.15		05/16/2011
MW-369M1	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	SW8330	0.22		0.20	-70.15	-80.15		05/16/2011
MW-369M1	N1	ND for 17 Analytes	Explosives	SW8330	ND	U	ND	-70.15	-80.15		05/16/2011
MW-369M2	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-32.15	-42.15	72.86	05/16/2011
MW-369M2	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-32.15	-42.15		05/16/2011
MW-370M2	N1	Perchlorate	PCATE	SW6850	8.3		0.80	-26.7	-36.7	72.04	11/18/2011
MW-370M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	1.6		0.20	-26.7	-36.7		11/18/2011
MW-370M2	N1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	-26.7	-36.7		11/18/2011
MW-370M2	FD1	Perchlorate	PCATE	SW6850	8.3		0.80	-26.7	-36.7		11/18/2011
MW-370M2	N1	Perchlorate	PCATE	SW6850	13.5		0.80	-26.7	-36.7	71.74	05/25/2011
MW-370M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	1.6		0.20	-26.7	-36.7		05/25/2011
MW-370M2	N1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	-26.7	-36.7		05/25/2011
MW-370M2	FD1	Perchlorate	PCATE	SW6850	13.3		0.80	-26.7	-36.7		05/25/2011
MW-370M2	LR1	Perchlorate	PCATE	SW6860	15.5		0.50	-26.7	-36.7		05/25/2011
MW-370M3	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	14.3	4.3	71.76	05/25/2011
MW-370M3	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	14.3	4.3		05/25/2011

Table 3-1
J-1 Range Northern Groundwater Monitoring Well Results for 2011

Location	Sample Type	Analyte	Analyte Short Name	Test Method	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Top of Screen (ft msl)	Bottom of Screen (ft msl)	Groundwater Elevation (ft msl)	Date
MW-401M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-58.85	-68.85	71.12	11/10/2011
MW-401M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-58.85	-68.85	70.76	05/24/2011
MW-401M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-58.85	-68.85		05/24/2011
MW-401M2	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	56.15	46.15	71.23	11/10/2011
MW-401M2	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	56.15	46.15	70.88	05/24/2011
MW-401M2	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	56.15	46.15		05/24/2011
MW-430M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-70.95	-80.95	70.92	11/10/2011
MW-430M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-70.95	-80.95	70.51	05/23/2011
MW-430M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-70.95	-80.95		05/23/2011
MW-430M2	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-13.95	-23.95	70.93	11/10/2011
MW-430M2	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-13.95	-23.95	70.53	05/23/2011
MW-430M2	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-13.95	-23.95		05/23/2011
MW-479M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-51.16	-61.16	70.95	05/23/2011
MW-479M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-51.16	-61.16		05/23/2011
MW-540M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-59.06	-69.06	70.96	11/15/2011
MW-540M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-59.06	-69.06	70.57	05/23/2011
MW-540M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-59.06	-69.06		05/23/2011
MW-541M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-45.77	-55.77	70.77	11/10/2011
MW-541M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-45.77	-55.77	70.38	05/23/2011
MW-541M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-45.77	-55.77		05/23/2011
MW-547M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-38.39	-48.39	71.26	12/05/2011
MW-547M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-38.39	-48.39		12/05/2011
MW-547M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	-38.39	-48.39	71.97	08/10/2011
MW-547M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-38.39	-48.39		08/10/2011
MW-547M1	N1	ND for 1 Analytes	Perchlorate	SW6850	ND		ND	-38.39	-48.39	71.27	04/07/2011
MW-547M1	N1	ND for 19 Analytes	Explosives	SW8330	ND		ND	-38.39	-48.39		04/07/2011
MW-547M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-38.39	-48.39		04/07/2011
MW-547M2	N1	Perchlorate	PCATE	SW6850	0.19	J	0.20	20.61	10.61	71.27	12/05/2011
MW-547M2	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	20.61	10.61		12/05/2011
MW-547M2	N1	Perchlorate	PCATE	SW6850	0.24		0.20	20.61	10.61	71.97	08/09/2011
MW-547M2	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	20.61	10.61		08/09/2011
MW-547M2	N1	ND for 19 Analytes	Explosives	SW8330	ND		ND	20.61	10.61	71.28	04/07/2011
MW-547M2	N1	Perchlorate	PCATE	SW6850	0.30		0.20	20.61	10.61		04/07/2011
MW-547M2	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	20.61	10.61		04/07/2011

Table 3-1
J-1 Range Northern Groundwater Monitoring Well Results for 2011

Location	Sample Type	Analyte	Analyte Short Name	Test Method	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Top of Screen (ft msl)	Bottom of Screen (ft msl)	Groundwater Elevation (ft msl)	Date
MW-549M1	N1	Perchlorate	PCATE	SW6850	4.2		0.20	-31.4	-41.4	71.61	12/05/2011
MW-549M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	SW8330	0.053	J	0.20	-31.4	-41.4		12/05/2011
MW-549M1	N1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	-31.4	-41.4		12/05/2011
MW-549M1	N1	Perchlorate	PCATE	SW6850	3.6		0.20	-31.4	-41.4	72.31	08/10/2011
MW-549M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-31.4	-41.4		08/10/2011
MW-549M1	N1	Perchlorate	PCATE	SW6850	0.64		0.20	-31.4	-41.4	71.54	04/07/2011
MW-549M1	N1	ND for 19 Analytes	Explosives	SW8330	ND		ND	-31.4	-41.4		04/07/2011
MW-549M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	-31.4	-41.4		04/07/2011
MW-549M2	N1	Perchlorate	PCATE	SW6850	0.10	J	0.20	8.7	-1.3	71.61	12/06/2011
MW-549M2	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	8.7	-1.3		12/06/2011
MW-549M2	N1	Perchlorate	PCATE	SW6850	0.11	J	0.20	8.7	-1.3		08/09/2011
MW-549M2	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	8.7	-1.3		08/09/2011
MW-549M2	N1	Perchlorate	PCATE	SW6850	0.10	J	0.20	8.7	-1.3	71.54	04/07/2011
MW-549M2	N1	ND for 19 Analytes	Explosives	SW8330	ND		ND	8.7	-1.3		04/07/2011
MW-549M2	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	8.7	-1.3		04/07/2011

Notes:

N1 = normal field sample
U = not detected
J = estimated
ND = not detected
FD = field duplicate
Log Date = field sampling date

LR = lab replicate
ug/L = micrograms per liter (parts per billion)
ft msl = feet relative to mean sea level

VOC = volatile organic compound
SVOC = semivolatile organic compound
HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine

Table 3-2
J-1 Range Northern Groundwater Profile and New Well Results for 2011

Location	Sample Type	Analyte	Analyte Short Name	Test Method	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Begin Depth	End Depth	Top of Screen (msl)	Bottom of Screen (msl)	Date
MW-561	N1	Perchlorate	PCATE	SW6850	0.091	J	0.20	160	165	32.1	27.1	06/22/2011
MW-561	N1	Perchlorate	PCATE	SW6850	0.078	J	0.20	170	175	22.1	17.1	06/22/2011
MW-561	N1	Perchlorate	PCATE	SW6850	0.16	J	0.20	180	185	12.1	7.1	06/22/2011
MW-561	N1	Perchlorate	PCATE	SW6850	0.046	J	0.20	190	195	2.1	-2.9	06/23/2011
MW-561	N1	Perchlorate	PCATE	SW6850	0.065	J	0.20	200	205	-7.9	-12.9	06/23/2011
MW-561	N1	Perchlorate	PCATE	SW6850	0.069	J	0.20	210	215	-17.9	-22.9	06/23/2011
MW-561	N1	Perchlorate	PCATE	SW6850	0.053	J	0.20	220	225	-27.9	-32.9	06/23/2011
MW-561	N1	Perchlorate	PCATE	SW6850	0.086	J	0.20	231	235	-38.9	-42.9	06/24/2011
MW-561	FD1	Perchlorate	PCATE	SW6850	0.082	J	0.20	231	235	-38.9	-42.9	06/24/2011
MW-561	N1	Perchlorate	PCATE	SW6850	0.039	J	0.20	262	266	-69.9	-73.9	06/30/2011
MW-561	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	160	165	32.1	27.1	06/22/2011
MW-561	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	170	175	22.1	17.1	06/22/2011
MW-561	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	180	185	12.1	7.1	06/22/2011
MW-561	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	190	195	2.1	-2.9	06/23/2011
MW-561	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	200	205	-7.9	-12.9	06/23/2011
MW-561	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	210	215	-17.9	-22.9	06/23/2011
MW-561	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	220	225	-27.9	-32.9	06/23/2011
MW-561	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	231	235	-38.9	-42.9	06/24/2011
MW-561	FD1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	231	235	-38.9	-42.9	06/24/2011
MW-561	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	262	266	-69.9	-73.9	06/30/2011
MW-562	N1	Perchlorate	PCATE	SW6850	0.065	J	0.20	150	155	42.1	37.1	07/07/2011
MW-562	N1	Perchlorate	PCATE	SW6850	0.15	J	0.20	160	165	32.1	27.1	07/07/2011
MW-562	N1	Perchlorate	PCATE	SW6850	0.16	J	0.20	170	175	22.1	17.1	07/07/2011
MW-562	N1	Perchlorate	PCATE	SW6850	0.063	J	0.20	180	185	12.1	7.1	07/08/2011
MW-562	FD2	Perchlorate	PCATE	SW6850	0.072	J	0.20	180	185	12.1	7.1	07/08/2011
MW-562	N1	Perchlorate	PCATE	SW6850	0.090	J	0.20	190	195	2.1	-2.9	07/08/2011
MW-562	N1	Perchlorate	PCATE	SW6850	0.090	J	0.20	200	205	-7.9	-12.9	07/08/2011
MW-562	N1	Perchlorate	PCATE	SW6850	0.097	J	0.20	210	215	-17.9	-22.9	07/08/2011
MW-562	N1	Perchlorate	PCATE	SW6850	0.048	J	0.20	220	225	-27.9	-32.9	07/11/2011
MW-562	N1	Perchlorate	PCATE	SW6850	0.085	J	0.20	230	235	-37.9	-42.9	07/11/2011
MW-562	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	150	155	42.1	37.1	07/07/2011
MW-562	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	160	165	32.1	27.1	07/07/2011
MW-562	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	170	175	22.1	17.1	07/07/2011
MW-562	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	180	185	12.1	7.1	07/08/2011
MW-562	FD2	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	180	185	12.1	7.1	07/08/2011
MW-562	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	190	195	2.1	-2.9	07/08/2011
MW-562	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	200	205	-7.9	-12.9	07/08/2011
MW-562	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	210	215	-17.9	-22.9	07/08/2011
MW-562	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	220	225	-27.9	-32.9	07/11/2011
MW-562	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	230	235	-37.9	-42.9	07/11/2011

Table 3-2
J-1 Range Northern Groundwater Profile and New Well Results for 2011

Location	Sample Type	Analyte	Analyte Short Name	Test Method	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Begin Depth	End Depth	Top of Screen (msl)	Bottom of Screen (msl)	Date
MW-563	N1	Perchlorate	PCATE	SW6850	0.17	J	0.20	159	163	30.89	26.89	07/25/2011
MW-563	N1	Perchlorate	PCATE	SW6850	0.11	J	0.20	169	173	20.89	16.89	07/26/2011
MW-563	N1	Perchlorate	PCATE	SW6850	0.13	J	0.20	178	182	11.89	7.89	07/27/2011
MW-563	N1	Perchlorate	PCATE	SW6850	0.17	J	0.20	189	193	0.89	-3.11	07/27/2011
MW-563	N1	Perchlorate	PCATE	SW6850	0.063	J	0.20	198	202	-8.11	-12.11	07/27/2011
MW-563	FD1	Perchlorate	PCATE	SW6850	0.044	J	0.20	198	202	-8.11	-12.11	07/27/2011
MW-563	N1	Perchlorate	PCATE	SW6850	0.046	J	0.20	209	213	-19.11	-23.11	07/27/2011
MW-563	N1	Perchlorate	PCATE	SW6850	1.4		0.20	219	223	-29.11	-33.11	07/28/2011
MW-563	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	159	163	30.89	26.89	07/25/2011
MW-563	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	169	173	20.89	16.89	07/26/2011
MW-563	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	178	182	11.89	7.89	07/27/2011
MW-563	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	189	193	0.89	-3.11	07/27/2011
MW-563	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	198	202	-8.11	-12.11	07/27/2011
MW-563	FD1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	198	202	-8.11	-12.11	07/27/2011
MW-563	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	209	213	-19.11	-23.11	07/27/2011
MW-563	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	219	223	-29.11	-33.11	07/28/2011
MW-563M1	N1	Perchlorate	PCATE	SW6850	0.42		0.20	215	225	-24.91	-34.91	12/06/2011
MW-563M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	215	225	-24.91	-34.91	12/06/2011
MW-563M1	N1	Perchlorate	PCATE	SW6850	0.26		0.20	215	225	-24.91	-34.91	09/27/2011
MW-563M1	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	215	225	-24.91	-34.91	09/27/2011
MW-564	N1	Perchlorate	PCATE	SW6850	0.074	J	0.20	168	178	28.38	18.38	08/02/2011
MW-564	N1	Perchlorate	PCATE	SW6850	0.059	J	0.20	177	181	19.38	15.38	08/03/2011
MW-564	N1	Perchlorate	PCATE	SW6850	0.16	J	0.20	189	193	7.38	3.38	08/03/2011
MW-564	N1	Perchlorate	PCATE	SW6850	0.073	J	0.20	199	200	-2.62	-3.62	08/03/2011
MW-564	N1	Perchlorate	PCATE	SW6850	0.052	J	0.20	207	210	-10.62	-13.62	08/05/2011
MW-564	N1	Perchlorate	PCATE	SW6850	0.28	J	0.20	218	220	-21.62	-23.62	08/08/2011
MW-564	FD1	Perchlorate	PCATE	SW6850	0.29	J	0.20	218	220	-21.62	-23.62	08/08/2011
MW-564	N1	Perchlorate	PCATE	SW6850	33.3	J	0.80	229	232	-32.62	-35.62	08/08/2011
MW-564	N1	Perchlorate	PCATE	SW6850	2.6	J	0.20	238.5	240	-42.12	-43.62	08/08/2011
MW-564	N1	Perchlorate	PCATE	SW6850	0.023	J	0.20	266	271	-69.62	-74.62	08/18/2011
MW-564	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	168	178	28.38	18.38	08/02/2011
MW-564	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	177	181	19.38	15.38	08/03/2011
MW-564	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	189	193	7.38	3.38	08/03/2011
MW-564	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	199	200	-2.62	-3.62	08/03/2011
MW-564	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	207	210	-10.62	-13.62	08/05/2011
MW-564	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	218	220	-21.62	-23.62	08/08/2011
MW-564	FD1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	218	220	-21.62	-23.62	08/08/2011
MW-564	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	229	232	-32.62	-35.62	08/08/2011
MW-564	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	238.5	240	-42.12	-43.62	08/08/2011
MW-564	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	266	271	-69.62	-74.62	08/18/2011

Table 3-2
J-1 Range Northern Groundwater Profile and New Well Results for 2011

Location	Sample Type	Analyte	Analyte Short Name	Test Method	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Begin Depth	End Depth	Top of Screen (msl)	Bottom of Screen (msl)	Date
MW-564M1	N1	Perchlorate	PCATE	SW6850	21.6		0.60	227	237	-30.26	-40.26	12/08/2011
MW-564M1	N1	Hexahydro-1,3,5-trinitro-	RDX	SW8330	0.56		0.20	227	237	-30.26	-40.26	12/08/2011
MW-564M1	N1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	227	237	-30.26	-40.26	12/08/2011
MW-564M1	N1	Perchlorate	PCATE	SW6850	8.3		0.20	227	237	-30.26	-40.26	09/27/2011
MW-564M1	N1	Hexahydro-1,3,5-trinitro-	RDX	SW8330	0.27		0.20	227	237	-30.26	-40.26	09/27/2011
MW-564M1	N1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	227	237	-30.26	-40.26	09/27/2011
MW-566	N1	Perchlorate	PCATE	SW6850	0.025	J	0.20	167	170	30.64	27.64	09/16/2011
MW-566	N1	Perchlorate	PCATE	SW6850	0.027	J	0.20	177	180	20.64	17.64	09/16/2011
MW-566	N1	Perchlorate	PCATE	SW6850	0.020	J	0.20	187	190	10.64	7.64	09/16/2011
MW-566	N1	Perchlorate	PCATE	SW6850	0.040	J	0.20	197	200	0.64	-2.36	09/23/2011
MW-566	N1	Perchlorate	PCATE	SW6850	0.14	J	0.20	207	210	-9.36	-12.36	09/23/2011
MW-566	N1	Perchlorate	PCATE	SW6850	0.037	J	0.20	217	220	-19.36	-22.36	09/23/2011
MW-566	N1	Perchlorate	PCATE	SW6850	3.1		0.20	227	230	-29.36	-32.36	09/26/2011
MW-566	N1	Perchlorate	PCATE	SW6850	6.4		0.20	237	240	-39.36	-42.36	09/26/2011
MW-566	N1	Perchlorate	PCATE	SW6850	0.084	J	0.20	246.5	250	-48.86	-52.36	10/04/2011
MW-566	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	167	170	30.64	27.64	09/16/2011
MW-566	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	177	180	20.64	17.64	09/16/2011
MW-566	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	187	190	10.64	7.64	09/16/2011
MW-566	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	197	200	0.64	-2.36	09/23/2011
MW-566	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	207	210	-9.36	-12.36	09/23/2011
MW-566	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	217	220	-19.36	-22.36	09/23/2011
MW-566	N1	Hexahydro-1,3,5-trinitro-	RDX	SW8330	0.027	J	0.20	227	230	-29.36	-32.36	09/26/2011
MW-566	N1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	227	230	-29.36	-32.36	09/26/2011
MW-566	N1	Hexahydro-1,3,5-trinitro-	RDX	SW8330	0.31		0.20	237	240	-39.36	-42.36	09/26/2011
MW-566	N1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	237	240	-39.36	-42.36	09/26/2011
MW-566	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	246.5	250	-48.86	-52.36	10/04/2011
MW-566M1	N1	Perchlorate	PCATE	SW6850	9.5		0.20	232	242	-34.32	-44.32	12/06/2011
MW-566M1	N1	Hexahydro-1,3,5-trinitro-	RDX	SW8330	0.35		0.20	232	242	-34.32	-44.32	12/06/2011
MW-566M1	N1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	232	242	-34.32	-44.32	12/06/2011
MW-566M1	FD1	Perchlorate	PCATE	SW6850	9.6		0.20	232	242	-34.32	-44.32	12/06/2011
MW-566M1	FD1	Hexahydro-1,3,5-trinitro-	RDX	SW8330	0.33		0.20	232	242	-34.32	-44.32	12/06/2011
MW-566M1	FD1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	232	242	-34.32	-44.32	12/06/2011

Table 3-2
J-1 Range Northern Groundwater Profile and New Well Results for 2011

Location	Sample Type	Analyte	Analyte Short Name	Test Method	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Begin Depth	End Depth	Top of Screen (msl)	Bottom of Screen (msl)	Date
MW-567	N1	Perchlorate	PCATE	SW6850	0.046	J	0.20	157	160	32.5	29.5	10/11/2011
MW-567	N1	Perchlorate	PCATE	SW6850	0.051	J	0.20	167	170	22.5	19.5	10/11/2011
MW-567	N1	Perchlorate	PCATE	SW6850	0.063	J	0.20	177	180	12.5	9.5	10/12/2011
MW-567	N1	Perchlorate	PCATE	SW6850	0.044	J	0.20	187	190	2.5	-0.5	10/12/2011
MW-567	FD1	Perchlorate	PCATE	SW6850	0.040	J	0.20	187	190	2.5	-0.5	10/12/2011
MW-567	N1	Perchlorate	PCATE	SW6850	0.28		0.20	197	200	-7.5	-10.5	10/12/2011
MW-567	N1	Perchlorate	PCATE	SW6850	0.37		0.20	207	210	-17.5	-20.5	10/13/2011
MW-567	N1	Perchlorate	PCATE	SW6850	11.3		0.40	217	220	-27.5	-30.5	10/13/2011
MW-567	N1	Perchlorate	PCATE	SW6850	0.52		0.20	227	230	-37.5	-40.5	10/14/2011
MW-567	N1	Perchlorate	PCATE	SW6850	0.039	J	0.20	236.5	240	-47	-50.5	10/14/2011
MW-567	N1	Perchlorate	PCATE	SW6850	0.022	J	0.20	247	250	-57.5	-60.5	10/17/2011
MW-567	N1	Perchlorate	PCATE	SW6850	0.022	J	0.20	257	260	-67.5	-70.5	10/18/2011
MW-567	N1	Perchlorate	PCATE	SW6850	0.037	J	0.20	267	270	-77.5	-80.5	10/19/2011
MW-567	N1	ND for 1 Analytes	Perchlorate	SW6850	ND	U	ND	277	280	-87.5	-90.5	10/19/2011
MW-567	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	157	160	32.5	29.5	10/11/2011
MW-567	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	167	170	22.5	19.5	10/11/2011
MW-567	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	177	180	12.5	9.5	10/12/2011
MW-567	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	187	190	2.5	-0.5	10/12/2011
MW-567	FD1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	187	190	2.5	-0.5	10/12/2011
MW-567	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	197	200	-7.5	-10.5	10/12/2011
MW-567	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	207	210	-17.5	-20.5	10/13/2011
MW-567	N1	Hexahydro-1,3,5-trinitro-	RDX	SW8330	0.45		0.20	217	220	-27.5	-30.5	10/13/2011
MW-567	N1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	217	220	-27.5	-30.5	10/13/2011
MW-567	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	227	230	-37.5	-40.5	10/14/2011
MW-567	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	236.5	240	-47	-50.5	10/14/2011
MW-567	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	247	250	-57.5	-60.5	10/17/2011
MW-567	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	257	260	-67.5	-70.5	10/18/2011
MW-567	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	267	270	-77.5	-80.5	10/19/2011
MW-567	N1	ND for 19 Analytes	Explosives	SW8330	ND	U	ND	277	280	-87.5	-90.5	10/19/2011
MW-567M1	N1	Perchlorate	PCATE	SW6850	1.6	J	0.20	215.5	225.5	-25.65	-35.65	12/08/2011
MW-567M1	N1	Hexahydro-1,3,5-trinitro-	RDX	SW8330	0.092	J	0.20	215.5	225.5	-25.65	-35.65	12/08/2011
MW-567M1	N1	ND for 18 Analytes	Explosives	SW8330	ND	U	ND	215.5	225.5	-25.65	-35.65	12/08/2011
MW-567M1	N1	ND for 18 Analytes	Explosives	SW8330	ND	UJ	ND	215.5	225.5	-25.65	-35.65	12/08/2011

Notes:

N1 = normal field sample
U = not detected
J = estimated
ND = not detected
FD = field duplicate
LR = lab replicate
ug/L = micrograms per liter (parts per billion)
ft msl = feet relative to mean sea level
VOC = volatile organic compound
SVOC = semivolatile organic compound

Table 4-1
Proposed J-1 Range Northern Interim Groundwater Chemical Monitoring Network for 2012

Location	Screen Interval (ft msl)	Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Parameters (b)
MW-136S	70.88 to 60.88	Monitor the trailing edge and source of the RDX and HMX plumes.	A	Explosives	A	Explosives
MW-164M1	-46.68 to -56.68	Monitor the lower eastern boundary of the RDX and HMX plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-164M2	23.32 to 13.32	Monitor adjacent to the core of the RDX and HMX plumes.	A	Explosives	A	Explosives
MW-166M1	-40.07 to -45.07	Monitor the lower boundary of the RDX plume.	A	Explosives	A	Explosives
MW-166M2	27.93 to 17.93	Monitor the core of the RDX and HMX plumes.	A	Explosives	A	Explosives
MW-166M3	52.93 to 42.93	Monitor the upper boundary of the RDX, HMX, and perchlorate plumes.	**A**	**Explosives, Perchlorate**	**A**	**Explosives**
MW-168M2	-43.86 to -53.86	Monitor the lower western boundary of the RDX and perchlorate plumes to confirm flow path from source area.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-168M3	51.14 to 41.14	Monitor the western boundary of the RDX and HMX plumes to confirm flow path from the source area.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-187D	-131.54 to -141.54	Benzene and other fuel-related constituents have historically exceeded their respective MCLs.	A	VOCs, SVOCs	A	VOCs, SVOCs
MW-187M1	14.46 to 4.46	Monitor the western boundary of the RDX and HMX plumes.	A	Explosives	A	Explosives
MW-188M1	24.41 to 14.41	Monitor the eastern boundary of the RDX and HMX plumes.	A	Explosives	A	Explosives
MW-191M2	59.62 to 49.62	Monitor the trailing edge and source of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-205M1	-4.24 to -14.24	Monitor the most downgradient RDX detection.	A	Explosives	**NA**	Explosives
MW-220M1	-55.85 to -65.85	Monitor the western boundary of the RDX and perchlorate plumes.	**S**	**Explosives, Perchlorate**	**A**	**Explosives, Perchlorate**
MW-253M1	-72.04 to -82.04	Monitor the western/leading edge of the RDX and perchlorate plumes.	**S**	**Explosives, Perchlorate**	**A**	**Explosives, Perchlorate**
MW-265M1	-72.77 to -82.77	Monitor the lower boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-265M2	-32.77 to -42.77	Monitor the core of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate

Table 4-1
Proposed J-1 Range Northern Interim Groundwater Chemical Monitoring Network for 2012

Location	Screen Interval (ft msl)	Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Parameters (b)
MW-265M3	-7.77 to -17.77	Monitor the upper boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-286M1	-63 to -73	Monitor the lower boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-286M2	-9 to -19	Monitor the leading edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-303M1	-118.28 to -128.28	Monitor the lower boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-303M2	-54.3 to -64.31	Monitor the core of the RDX, HMX, and perchlorate plumes to understand the dynamics of the higher concentrations	S	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-303M3	41.05 to 31.1	Monitor the core of the RDX, HMX, and perchlorate plumes to understand the dynamics of the higher concentrations	S	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-306D	-105.99 to -115.99	Benzene and other fuel-related constituents have historically exceeded their respective MCLs.	A	VOCs, SVOCs	A	VOCs, SVOCs
MW-306M1	0.79 to -9.21	Monitor the western boundary of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-306M2	20.98 to 10.98	Monitor the western boundary of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-315M1	-55.27 to -65.27	Monitor the western edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-315M2	-4.78 to -14.78	Monitor the western edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-326M1	-63.66 to -73.66	Monitor the lower boundary of the RDX and perchlorate plumes to confirm plume extent.	**S**	**Explosives, Perchlorate**	**A**	**Explosives, Perchlorate**
MW-326M2	-9.92 to -19.93	Monitor the core of the RDX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-326M3	21.11 to 11.09	Monitor the upper boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-346M1	-63.9 to -73.9	Monitor the lower boundary of the perchlorate and RDX plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-346M2	-24.21 to -34.21	Monitor the lower boundary of the perchlorate and RDX plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-346M3	5.52 to -4.48	Monitor the core of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate

Table 4-1
Proposed J-1 Range Northern Interim Groundwater Chemical Monitoring Network for 2012

Location	Screen Interval (ft msl)	Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Parameters (b)
MW-346M4	40.41 to 30.41	Monitor the upper boundary of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-349M2	-7.31 to -17.31	Monitor the eastern boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-369M1	-70.07 to -80.07	Monitor the western boundary of the RDX and perchlorate plumes.	**S**	**Explosives, Perchlorate**	**A**	**Explosives, Perchlorate**
MW-369M2	-32 to -42	Monitor the western boundary of the RDX and perchlorate plumes.	**A**	**Explosives, Perchlorate**	**NA**	**Explosives, Perchlorate**
MW-370M2	-26.54 to -36.54	Monitor the leading edge of the RDX and perchlorate plumes.	S	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-370M3	14.04 to 4.04	Monitor the upper boundary of the leading edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-401M1	-58.95 to -68.95	Monitor the leading edge of the J-1 Northern plume to confirm contamination is upgradient of Wood Road.	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-401M2	56.09 to 46.09	Monitor the leading edge of the J-1 Northern plume to confirm contamination is upgradient of Wood Road.	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-430M1	-71.18 to -81.18	Monitor the leading edge of the J-1 Northern plume to confirm contamination is upgradient of Wood Road.	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-430M2	-14.36 to -24.36	Monitor the leading edge of the J-1 Northern plume to confirm contamination is upgradient of Wood Road.	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-479M1	-50.75 to -60.75	Monitor downgradient of the main J-1 Range Northern plume.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-540M1	-64.61 to -74.61	Monitor the plume in the vicinity of Wood Road	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-541M1	-45.76 to -55.76	Monitor the plume in the vicinity of Wood Road	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-547M1	-38.39 to -48.39	Monitor the leading edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-547M2	20.61 to 10.61	Monitor the leading edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-549M1	-31.40 to -41.40	Monitor the leading edge of the RDX and perchlorate plumes.	S	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-549M2	8.70 to -1.30	Monitor the leading edge of the RDX and perchlorate plumes.	S	Explosives, Perchlorate	S	Explosives, Perchlorate

Table 4-1
Proposed J-1 Range Northern Interim Groundwater Chemical Monitoring Network for 2012

Location	Screen Interval (ft msl)	Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Parameters (b)
MW-563M1	-24.91 to -34.91	Monitor the western edge of the RDX and perchlorate plumes.	NA	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-564M1	-30.26 to -40.26	Monitor the leading edge of the RDX and perchlorate plumes.	NA	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-566M1	-34.32 to -44.32	Monitor the leading edge of the RDX and perchlorate plumes.	NA	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-567M1	-25.65 to -35.65	Monitor the eastern edge of the RDX and perchlorate plumes.	NA	Explosives, Perchlorate	A	Explosives, Perchlorate

Notes:

J-1 = J-1 Range
ft = feet
m = meters
msl = mean sea level
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine
HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
SVOC = semi-volatile organic compound
VOC = volatile organic compound

(a)
A = annually
S = semiannually

(b)
Explosives = EPA Method SW846/8330
Perchlorate = EPA Method SW846/6850
SVOCs = EPA Method SW846/8270C
VOCs = EPA Method SW846/8260B

Proposed change to sampling program.
NA Well not in program.

APPENDIX A

Project Note- Changes to J-1 Range Northern and Southern Chemical and Hydraulic Monitoring Well Networks

PROJECT NOTE

Client, Project and Location:
Impact Area Groundwater Study Program
J-1 Range Northern and Southern Sites
Camp Edwards, MA

Subject: Changes to J-1 Range Northern and Southern Chemical and Hydraulic Monitoring Well Networks

Date: November 7, 2012

PURPOSE

On September 12, 2012, the U.S. Army National Guard's Impact Area Groundwater Study Program (IAGWSP), submitted response to comments on the Draft J-1 Range Northern 2011 and J-1 Southern Annual 2011 Environmental Monitoring Report, dated June 2012. Comments were received from U.S. Environmental Protection Agency and from the Massachusetts Department of Environmental Protection (MassDEP) in letters dated August 1, 2012, and July 18, 2012, respectively. MassDEP approved the RCL in a letter dated September 20, 2012.

EPA offered an additional comment (re-survey of monitoring wells in 2012, at specified locations for J-1 Range Southern Range) for conditional approval of the RCL by e-mail on October 11, 2012. IAGWSP confirmed acceptance the additional comment via e-mail on October 16, 2012 as the Memorandum of Resolution (MOR). This Project Note (PN) documents agency concurrence with the changes to the chemical and hydraulic monitoring network described in the draft report, RCL, and MOR. The attached tables show the approved chemical and hydraulic monitoring networks.

CONCURRENCE

Concurrence with the agreements presented in this project note are represented by the signatures below:

Jane Nolan 11-20-12
USEPA Representative

12/6/12
MassDEP Representative

IAGWSP Representative

Distribution: L. Jennings and J. Dolan (EPA); L. Pinaud and M. Panni (MassDEP); B. Gregson, D. Hill, and P. Richardson (IAGWSP); C. Kilbridge, J. Ehret, G. Kaso, M. Anderson, and M. Wojtas (USACE).

Table 1
J-1 Range Northern Interim Groundwater Chemical Monitoring Network- November 2012

Location	Screen Interval (ft msl)	Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Parameters (b)
MW-136S	70.88 to 60.88	Monitor the trailing edge and source of the RDX and HMX plumes.	A	Explosives	A	Explosives
MW-164M1	-46.68 to -56.68	Monitor the lower eastern boundary of the RDX and HMX plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-164M2	23.32 to 13.32	Monitor adjacent to the core of the RDX and HMX plumes.	A	Explosives	A	Explosives
MW-166M1	-40.07 to -45.07	Monitor the lower boundary of the RDX plume.	A	Explosives	A	Explosives
MW-166M2	27.93 to 17.93	Monitor the core of the RDX and HMX plumes.	A	Explosives	A	Explosives
MW-166M3	52.93 to 42.93	Monitor the upper boundary of the RDX, HMX, and perchlorate plumes.	**A**	**Explosives, Perchlorate**	**A**	**Explosives**
MW-168M2	-43.86 to -53.86	Monitor the lower western boundary of the RDX and perchlorate plumes to confirm flow path from source area.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-168M3	51.14 to 41.14	Monitor the western boundary of the RDX and HMX plumes to confirm flow path from the source area.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-187D	-131.54 to -141.54	Benzene and other fuel-related constituents have historically exceeded their respective MCLs.	A	VOCs, SVOCs	A	VOCs, SVOCs
MW-187M1	14.46 to 4.46	Monitor the western boundary of the RDX and HMX plumes.	A	Explosives	A	Explosives
MW-188M1	24.41 to 14.41	Monitor the eastern boundary of the RDX and HMX plumes.	A	Explosives	A	Explosives
MW-191M2	59.62 to 49.62	Monitor the trailing edge and source of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-205M1	-4.24 to -14.24	Monitor the most downgradient RDX detection.	A	Explosives	**NA**	Explosives
MW-220M1	-55.85 to -65.85	Monitor the western boundary of the RDX and perchlorate plumes.	**S**	**Explosives, Perchlorate**	**A**	**Explosives, Perchlorate**
MW-253M1	-72.04 to -82.04	Monitor the western/leading edge of the RDX and perchlorate plumes.	**S**	**Explosives, Perchlorate**	**A**	**Explosives, Perchlorate**
MW-265M1	-72.77 to -82.77	Monitor the lower boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-265M2	-32.77 to -42.77	Monitor the core of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate

Table 1
J-1 Range Northern Interim Groundwater Chemical Monitoring Network- November 2012

Location	Screen Interval (ft msl)	Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Parameters (b)
MW-265M3	-7.77 to -17.77	Monitor the upper boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-286M1	-63 to -73	Monitor the lower boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-286M2	-9 to -19	Monitor the leading edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-303M1	-118.28 to -128.28	Monitor the lower boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-303M2	-54.3 to -64.31	Monitor the core of the RDX, HMX, and perchlorate plumes to understand the dynamics of the higher concentrations	S	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-303M3	41.05 to 31.1	Monitor the core of the RDX, HMX, and perchlorate plumes to understand the dynamics of the higher concentrations	S	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-306D	-105.99 to -115.99	Benzene and other fuel-related constituents have historically exceeded their respective MCLs.	A	VOCs, SVOCs	A	VOCs, SVOCs
MW-306M1	0.79 to -9.21	Monitor the western boundary of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-306M2	20.98 to 10.98	Monitor the western boundary of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-315M1	-55.27 to -65.27	Monitor the western edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-315M2	-4.78 to -14.78	Monitor the western edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-326M1	-63.66 to -73.66	Monitor the lower boundary of the RDX and perchlorate plumes to confirm plume extent.	**S**	**Explosives, Perchlorate**	**A**	**Explosives, Perchlorate**
MW-326M2	-9.92 to -19.93	Monitor the core of the RDX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-326M3	21.11 to 11.09	Monitor the upper boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-346M1	-63.9 to -73.9	Monitor the lower boundary of the perchlorate and RDX plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-346M2	-24.21 to -34.21	Monitor the lower boundary of the perchlorate and RDX plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-346M3	5.52 to -4.48	Monitor the core of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate

Table 1
J-1 Range Northern Interim Groundwater Chemical Monitoring Network- November 2012

Location	Screen Interval (ft msl)	Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Parameters (b)
MW-346M4	40.41 to 30.41	Monitor the upper boundary of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-349M2	-7.31 to -17.31	Monitor the eastern boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-369M1	-70.07 to -80.07	Monitor the western boundary of the RDX and perchlorate plumes.	**S**	**Explosives, Perchlorate**	**A**	**Explosives, Perchlorate**
MW-369M2	-32 to -42	Monitor the western boundary of the RDX and perchlorate plumes.	**A**	**Explosives, Perchlorate**	**NA**	**Explosives, Perchlorate**
MW-370M2	-26.54 to -36.54	Monitor the leading edge of the RDX and perchlorate plumes.	S	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-370M3	14.04 to 4.04	Monitor the upper boundary of the leading edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-401M1	-58.95 to -68.95	Monitor the leading edge of the J-1 Northern plume to confirm contamination is upgradient of Wood Road.	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-401M2	56.09 to 46.09	Monitor the leading edge of the J-1 Northern plume to confirm contamination is upgradient of Wood Road.	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-430M1	-71.18 to -81.18	Monitor the leading edge of the J-1 Northern plume to confirm contamination is upgradient of Wood Road.	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-430M2	-14.36 to -24.36	Monitor the leading edge of the J-1 Northern plume to confirm contamination is upgradient of Wood Road.	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-479M1	-50.75 to -60.75	Monitor downgradient of the main J-1 Range Northern plume.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-540M1	-64.61 to -74.61	Monitor the plume in the vicinity of Wood Road	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-541M1	-45.76 to -55.76	Monitor the plume in the vicinity of Wood Road	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-547M1	-38.39 to -48.39	Monitor the leading edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-547M2	20.61 to 10.61	Monitor the leading edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-549M1	-31.40 to -41.40	Monitor the leading edge of the RDX and perchlorate plumes.	S	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-549M2	8.70 to -1.30	Monitor the leading edge of the RDX and perchlorate plumes.	S	Explosives, Perchlorate	S	Explosives, Perchlorate

Table 1
J-1 Range Northern Interim Groundwater Chemical Monitoring Network- November 2012

Location	Screen Interval (ft msl)	Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Parameters (b)
MW-563M1	-24.91 to -34.91	Monitor the western edge of the RDX and perchlorate plumes.	NA	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-564M1	-30.26 to -40.26	Monitor the leading edge of the RDX and perchlorate plumes.	NA	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-566M1	-34.32 to -44.32	Monitor the leading edge of the RDX and perchlorate plumes.	NA	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-567M1	-25.65 to -35.65	Monitor the eastern edge of the RDX and perchlorate plumes.	NA	Explosives, Perchlorate	A	Explosives, Perchlorate

Notes:

J-1 = J-1 Range
ft = feet
m = meters
msl = mean sea level
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine
HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
SVOC = semi-volatile organic compound
VOC = volatile organic compound

(a)
A = annually
S = semiannually
(b)
Explosives = EPA Method SW846/8330
Perchlorate = EPA Method SW846/6850
SVOCs = EPA Method SW846/8270C
VOCs = EPA Method SW846/8260B

NA = Proposed change to sampling program.
NA = Well not in program.

Table 2
J-1 Range Southern Groundwater Chemical Monitoring Network- November 2012

Location	Screen Interval (ft msl)			Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Approved Parameters (b)
DP-379	-28.98	to	-33.98	Monitor the northeastern boundary of the J-1 S plume	A	Explosives	A	Explosives
DP-389	-7.26	to	-12.26	Monitor the lower boundary of the J-1 S plume	A	Explosives	A	Explosives
J1SEW0001	42	to	2	Extraction well for J-1 S ETI System, used to help calculate and confirm mass removal by the system	M	Explosives	M	Explosives
MW-131S	71.3	to	61.3	Potential source area well and northern boundary well to monitor explosives	A	Explosives	A	Explosives
MW-360M2	63.11	to	53.11	Monitor the source area and trailing edge of the J-1 S plume	S	Explosives	**A**	Explosives
MW-398M1	-10.72	to	-20.72	Monitor groundwater below core of J-1 S plume	A	Explosives	A	Explosives
MW-398M2	29.9	to	19.9	Monitor core of J-1 S plume	A	Explosives	A	Explosives
MW-400M1	-55.78	to	-65.78	Monitor downgradient of the leading edge of the J-1 S plume	A	Explosives	**S**	Explosives
MW-400M2	-1.92	to	-11.92	Monitor downgradient of the leading edge of the J-1 S plume	A	Explosives	**S**	Explosives
MW-402M1	-49.25	to	-59.25	Monitor downgradient of the leading edge of the J-1 S plume	A	Explosives	**S**	Explosives
MW-402M2	-14.35	to	-24.35	Monitor downgradient of the leading edge of the J-1 S plume	S	Explosives	S	Explosives
MW-403M1	-12.18	to	-22.18	Monitor downgradient of the leading edge of the J-1 S plume	A	Explosives	**S**	Explosives
MW-403M2	20.46	to	10.46	Monitor downgradient of the leading edge of the J-1 S plume	S	Explosives	S	Explosives
MW-480M2	9.56	to	-0.44	Monitor the southwestern boundary of the J-1 S plume	A	Explosives	A	Explosives
MW-481M1	-33.58	to	-43.58	Monitor the core of the J-1 S plume	A	Explosives	A	Explosives
MW-481M2	9.88	to	-0.12	Monitor the core of the J-1 S plume	S	Explosives	**A**	Explosives
MW-482M2	-16.63	to	-26.63	Monitor the northeastern boundary of the J-1 S plume	S	Explosives	**A**	Explosives
MW-482M3	58.08	to	48.08	Monitor the northeastern boundary of the J-1 S plume	A	Explosives	A	Explosives
MW-483M1	22.61	to	12.61	Monitor the southeastern boundary of the J-1 S plume	A	Explosives	A	Explosives

Table 2
J-1 Range Southern Groundwater Chemical Monitoring Network- November 2012

Location	Screen Interval (ft msl)			Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Approved Parameters (b)
MW-488M1	12.8	to	2.8	Monitor the core of the J-1 S plume	A	Explosives	A	Explosives
MW-488PZ	43.14	to	33.14	Monitor the upper boundary of the J-1 S plume	A	Explosives	A	Explosives
MW-521M1	-21.74	to	-31.74	Monitor the northwestern edge of the plume south of base boundary	A	Explosives	A	Explosives
MW-522M1	-46.26	to	-56.26	Monitor near core of plume	S	Explosives	**A**	Explosives
MW-522M2	-13.26	to	-23.26	Monitor near core of plume	S	Explosives	**A**	Explosives
MW-523M1	-9.83	to	-19.83	Monitor the southwestern boundary of the plume	A	Explosives	A	Explosives
MW-524M1	6.32	to	-3.68	Monitor near core of plume	S	Explosives	S	Explosives
MW-525M1	-19.61	to	-29.61	Monitor the leading edge of the plume	S	Explosives	**A**	Explosives
MW-525M2	4.39	to	-5.61	Monitor the leading edge of the plume	S	Explosives	**A**	Explosives
MW-526M1	-11.28	to	-21.28	Monitor the leading edge of the plume	S	Explosives	**A**	Explosives
MW-527M1	-13.38	to	-23.38	Monitor the leading edge of the plume	S	Explosives	**A**	Explosives
MW-528M1	39.68	to	29.68	Monitor downgradient of source area along plume core	S	Explosives	**A**	Explosives

Notes:

J-1 = J-1 Range

J-1 S = J-1 Southern

ft = feet

m = meters
msl = mean sea level
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine
HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine

(a)

A = annually

S = semiannually

(b)
Explosives = EPA Method SW846/8330
Perchlorate = EPA Method SW846/6850

Yellow shading denotes changes to sample program

Table 3
J-1 Range Southern Hydraulic Monitoring Network- November 2012

Well	Easting Coordinate on Surface (N83 UTM m)	Northing Coordinate on Surface (N83 UTM m)	Surface Elevation (ft msl)	MP Elev (ft msl)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)	Mid Screen Elevation (ft msl)
90MW0033	374225	4616203	152.10	154.34	-2.63	-7.63	5	-5.13
90MW0036	373998	4616722	124.00	126.31	19.35	14.35	5	16.85
90MW0037	374009	4616876	157.10	156.42	47.21	42.21	5	44.71
90MW0041	373823	4616886	159.60	161.63	34.23	29.23	5	31.73
90MW0052	374193	4616629	129.80	132.50	34.87	29.87	5	32.37
90WT0010	374688	4616174	152.40	151.97	69.05	59.05	10	64.05
BH70-A	373882	4617359	164.88	165.79	59.38	49.38	10	54.38
DP-379	374279	4617054	160.42	162.46	-28.98	-33.98	5	-31.48
J1SEW0001	374216	4616909	N/A	161.35	44	4	40	24
MW-131M2	374087	4617258	167.30	167.02	-27.70	-37.70	10	-32.70
MW-131S	374087	4617258	167.30	167.00	71.30	61.30	10	66.30
MW-290M3	373814	4617213	164.50	163.73	20.03	10.03	10	15.03
MW-290S	373814	4617214	164.30	164.04	64.20	54.20	10	59.20
MW-360M1	374053	4617208	165.11	164.41	-81.89	-91.89	10	-86.89
MW-360M2	374053	4617208	165.11	164.37	63.11	53.11	10	58.11
MW-398M1	374215	4616913	161.43	161.09	-10.72	-20.72	10	-15.72
MW-398M2	374215	4616913	161.43	161.11	29.90	19.90	10	24.90
MW-400M1	374501	4616446	136.98	136.7	-55.78	-65.78	10	-60.78
MW-400M2	374501	4616446	136.98	136.69	-1.92	-11.92	10	-6.92
MW-400PZ	374501	4616446	136.98	136.43	72.32	62.32	10	67.32
MW-402M1	374419	4616370	140.89	140.25	-49.25	-59.25	10	-54.25
MW-402M2	374419	4616370	140.89	140.26	-14.35	-24.35	10	-19.35
MW-402PZ	374419	4616370	140.89	140.02	71.16	61.16	10	66.16
MW-403M1	374595	4616510	147.72	147.09	-12.18	-22.18	10	-17.18
MW-403M2	374595	4616510	147.72	147.09	20.46	10.46	10	15.46
MW-480M2	374237	4616721	153.13	152.77	9.56	-0.44	10	4.56
MW-481M1	374301	4616794	156.16	155.65	-33.58	-43.58	10	-38.58
MW-481M2	374301	4616794	156.16	155.66	9.88	-0.12	10	4.88
MW-482M2	374371	4616838	156.01	155.46	-16.63	-26.63	10	-21.63

Table 3
J-1 Range Southern Hydraulic Monitoring Network- November 2012

Well	Easting Coordinate on Surface (N83 UTM m)	Northing Coordinate on Surface (N83 UTM m)	Surface Elevation (ft msl)	MP Elev (ft msl)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)	Mid Screen Elevation (ft msl)
MW-482M3	374371	4616838	156.26	155.78	58.08	48.08	10	53.08
MW-483M1	374177	4616833	162.13	162.54	22.61	12.61	10	17.61
MW-483PZ	374177	4616834	165.00	162.25	56.71	46.71	10	51.71
MW-488M1	374227	4616942	162.42	162.51	12.8	2.8	10	7.80
MW-488PZ	374227	4616942	162.42	162.51	43.14	33.14	10	38.14
MW-521M1	374299	4616623	136.26	136.13	-21.74	-31.74	10	-26.74
MW-521M2	374299	4616623	136.26	136.09	34.26	24.26	10	29.26
MW-522M1	374363	4616536	151.74	151.43	-46.26	-56.26	10	-51.26
MW-522M2	374363	4616536	151.74	151.42	-13.26	-23.26	10	-18.26
MW-522PZ	373363	4616536	151.74	151.37	33.74	23.74	10	28.74
MW-523M1	374292	4616436	148.17	147.87	-9.83	-19.83	10	-14.83
MW-523PZ	374292	4616436	148.17	147.89	34.17	24.17	10	29.17
MW-524M1	374444	4616681	154.32	154.03	6.32	-3.68	10	1.32
MW-524PZ	374444	4616681	154.32	154.03	35.32	25.32	10	30.32
MW-525M1	374449	4616269	152.39	152.05	-19.61	-29.61	10	-24.61
MW-525M2	374449	4616269	152.39	152.07	4.39	-5.61	10	-0.61
MW-526M1	374367	4616279	152.72	152.44	-11.28	-21.28	10	-16.28
MW-526PZ	374367	4616279	152.72	152.46	35.72	25.72	10	30.72
MW-527M1	374287	4616286	151.62	151.32	-13.38	-23.38	10	-18.38
MW-527PZ	374287	4616286	151.62	151.32	33.62	23.62	10	28.62
MW-528M1	374108	4617067	156.68	156.42	39.68	29.68	10	34.68

ft msl = feet mean sea level
N83UTM m = North American Datum of 1983 Universal Transverse Mercator coordinates in meters

Impact Area Groundwater Study Program

FINAL

J-1 Range Southern
Annual 2011 Environmental Monitoring Report

Camp Edwards

Massachusetts Military Reservation

Cape Cod, Massachusetts

December 2012

Prepared for:

Army National Guard
Impact Area Groundwater Study Program
Camp Edwards, Massachusetts

Prepared by:

U.S. Army Corps of Engineers
New England District
Concord, Massachusetts

DISCLAIMER

This document has been prepared pursuant to government administrative orders (U.S. EPA Region I SDWA Docket No. I-97-1019 and 1-2000-0014) and is subject to approval by the U. S. Environmental Protection Agency. The opinions, findings, and conclusions expressed are those of the authors and not necessarily those of the Environmental Protection Agency.

TABLE OF CONTENTS

Page

List of Figures

List of Tables

List of Appendices

ACRONYMS AND ABBREVIATIONS

COC	contaminant of concern
EPA	U.S. Environmental Protection Agency
ETI	extraction, treatment, and infiltration
ft/ft	feet per foot
GAC	granular activated carbon
gpm	gallons per minute
HMX	octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
IAGWSP	Impact Area Groundwater Study Program
MMR	Massachusetts Military Reservation
msl	mean sea level
MTU	modular treatment unit
ND	nondetect
RDX	hexahydro-1,3,5-trinitro-1,3,5-triazine
RRA	rapid response action
TOM	top of mound
USGS	US Geological Survey
µg/L	micrograms per lit

1.0 INTRODUCTION

The J-1 Range (Figure 1-1) is located adjacent to and southeast of the Massachusetts Military Reservation (MMR) Impact Area, and is one of the four former training ranges that comprise the Southeast Ranges. The Southeast Ranges are former military training ranges and defense contractor test ranges that operated from 1935 to 1997. The J-1 Range was used from 1935 through the mid 1980s. The J-1 Range southern plume consists of groundwater contaminated with levels of hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX) above the current risk-based concentration of 0.6 micrograms per liter (µg/L), the Massachusetts Contingency Plan Groundwater-1 Standard of 1 µg/L, and the U.S. Environmental Protection Agency (EPA) Health Advisory of 2 µg/L.

The J-1 Range southern Rapid Response Action (RRA) Extraction, Treatment, Injection (ETI) system was designed to mitigate further migration of the plume by capturing and treating contaminated groundwater at the base boundary pending selection of a comprehensive remedy for the entire plume. The system began operation on 9 October 2007. This annual environmental monitoring report for the J-1 Range southern RDX plume (Figure 1-1) includes: 1) an analysis of the effectiveness of the RRA ETI system in removing explosives (principally RDX) from groundwater; 2) a hydraulic evaluation to determine the effects of pumping stress on the aquifer; and 3) an assessment of plume dynamics.

The *Final J-1 South Rapid Response Action System Performance Monitoring Plan* (ECC 2007a) was the original plan for monitoring the J-1 Range southern plume. Subsequent modifications to the chemical and hydraulic monitoring well network were approved in the *Final J-1 Range North and J-1 Range South Annual 2008 Environmental Monitoring Report* (ECC 2009) and *Final J-1 Range Northern and J-1 Range Southern Annual 2009 and 2010 Environmental Monitoring Reports* (USACE 2010, 2011). There are currently 31 wells in the chemical monitoring network, which includes the extraction well, J1SEW0001. The wells in the chemical monitoring network are listed in Table 1-1 and depicted in Figure 1-2 of this report. The 50 hydraulic monitoring network wells are presented in Table 1-2 and Figure 1-3.

Results for groundwater and ETI system monitoring activities conducted between January 2011 and December 2011 are presented in this report along with an analysis of the differences between model-predicted and observed concentrations, mass removal, and opportunities for optimizing the ETI system.

2.0 J-1 RANGE SOUTHERN TREATMENT FACILITIES AND WELLFIELD OPERATING CONDITIONS

The J-1 Range southern ETI system, shown in Figure 2-1, consists of one extraction well which operated at 75 gallons per minute (gpm) from start-up on 2 October 2007, until 23 September 2009 when the system was optimized based on groundwater modeling. Since September 2009 the groundwater extraction rate has been 45 gpm. The J-1 Range southern groundwater treatment system is described by the process flow diagram shown on Figure 2-2. The treatment train consists of granular activated carbon (GAC) media to remove explosives. The GAC vessels are housed in a modular treatment unit (MTU). Additional details of the ETI system and its components can be found in the *Final J-1 Range South Groundwater Rapid Response Action Plan* (ECC 2007b).

The J-1 Range southern groundwater treatment system has a design capacity of 125 gpm. The MTU contains GAC in six pressure vessels that are sequentially arrayed in pairs that are the functional equivalent of three vessels in series. Each vessel contains 1,000 pounds of GAC (Figure 2-2). The lead (first) pair of vessels remove explosives from the groundwater influent. The lag (second) pair of vessels serves as the second stage of treatment and removes any explosives contamination that breaks through the lead vessels. The guard (third) pair of vessels provides backup capacity and final polishing capability. This arrangement of treatment vessels ensures that any contaminant breakthrough from the lead/lag vessels will be captured prior to discharge. Effluent from the GAC vessels is discharged to an infiltration trench located south of the MTU on the base boundary (Figure 2-1).

During this reporting period, the ETI system had 96.75 percent “up time”. Up-time is a measure of system reliability and is defined as the number of hours the system actively treats groundwater during a given time period divided by the number of elapsed hours during the period (expressed as a percentage). During this reporting period, the J-1 Range pumps were down for 283.6 hours out of 8736 possible pump-hours between 31 December 2010 and 29 December 2011. A summary of the downtime for the J-1 Range Southern system for this reporting period is presented in Table 2-1. Figure 2-3 provides a graphical presentation of system availability and downtime for this period as well as for the entire period since system startup.

3.0 J-1 RAPID RESPONSE ACTION ETI SYSTEM PERFORMANCE RESULTS

This section presents a detailed discussion of sampling history for the annual reporting period 1 January 2011 through 31 December 2011.

3.1 Operations

During the 2011 reporting period the treatment system samples were collected monthly from the influent, mid-point (MID-2 January-June, 2011 & MID-1 July-December, 2011), and effluent ports (Figure 2-2) and analyzed for explosives in accordance with the system performance monitoring plan (ECC 2007a). Table 3-1 summarizes the operational system monitoring parameters and sample frequency requirements.

Monthly mid-point system sampling at MID-2 reflected a continuation of mid-point sampling at MID-2 that began in June 2009 following breakthrough of RDX detected at the J1S-MID port in May 2009. Mid-point system sampling continued at the MID-2 port until breakthrough of RDX was detected in the Lag GAC vessels in the May 2011 monthly sample. The MID-2 sample location was used once more for the June 2011 mid-point RDX sample location (ND), and new carbon was changed out in the Lead and Lag GAC vessels during June 13-15, 2011. Mid-point system sampling resumed at the MID-1 port in July 2011.

Analytical results for the reporting period, including RDX, HMX, and field parameter measurements are presented in Table 3-2.

3.2 Results

Influent concentrations of RDX were generally stable during the 2011 reporting period. Values ranged between 0.292 µg/L and 0.524 µg/L Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX) was not detected throughout the reporting period. Since system startup in 2007, influent RDX and HMX concentration values have decreased substantially (Figure 3-1).

3.3 Breakthrough of Contaminants of Concern (COCs)

Breakthrough at the J-1 Range southern ETI system is defined as any concentration of explosives detected in effluent from the treatment vessel at or above an action level of 0.25 µg/L for RDX. The trigger for a GAC exchange is breakthrough of explosives from the second (lag) vessel (i.e., as MID-2 sampling port as shown in Figure 2-2).

RDX was detected at a concentration of 0.256 µg/l in a sample collected from the MID-2 port on May 9, 2011 (Table 3-2). Subsequently, the carbon in the lead and lag carbon vessels was exchanged for new carbon (changed out) on 13 to 15 June, 2011. No other breakthrough was measured during this reporting period.

3.4 Total Groundwater Treated

The total volume of groundwater extracted, treated, and infiltrated by the J-1 Range southern ETI system during 2011 was approximately 22.8 million gallons. Since its startup in October 2007, a total of 131 million gallons of groundwater has been treated by the system (Figure 3-2).

3.5 Mass Removal

The method for calculating the mass removal values presented in this section is concentration (C) multiplied by system flow rate (Q) multiplied by time of operation (T). Time of operation can be affected by system down time, if any (Table 2-1). Figure 3-1 is a plot of the influent concentration (C) on a monthly basis, Figure 3-2 is a plot of the influent volume treated (Q*T), and Figure 3-3 is a resulting plot of calculated mass removed on a monthly basis (C*Q*T).

During 2011 operations, the J-1 Range southern ETI system removed approximately 0.080 pounds of RDX and no HMX from the J-1 Range southern plume. Since startup 2007, the system has removed a total of 2.0 pounds of RDX and 0.50 pounds of HMX (Figure 3-3).

Estimates of the modeled plume mass removal are discussed in Section 6.0.

4.0 HYDRAULIC PERFORMANCE MONITORING

The purpose of the hydraulic monitoring is to assess long-term trends in groundwater levels and evaluate system performance by analyzing changes in hydraulic gradients induced by system operations, assess effects resulting from changes in system operations, and provide a basis for groundwater model refinement and system optimization, if warranted. The J-1 Range southern hydraulic monitoring program has been in place since start-up of ETI activities and the results of the program were summarized in the *Final J-1 Range Southern Groundwater Rapid Response Action 6-Month System Performance Monitoring (SPM) Report* (USACE 2009) and subsequent annual reports (USACE 2010, 2011). The *Final J-1 Range North and J-1 Range South 2008 Annual Environmental Monitoring Report* (ECC 2009) recommended that pumping at extraction well J1SEW0001 be reduced from 75 gpm to 45 gpm, based on numerical modeling and capture zone analysis, and that synoptic water level events be reduced from semi-annual to annual. The extraction well flow rate was reduced to 45 gpm on 23 September 2009.

4.1 Synoptic Water Level Measurements In 2011

Hydraulic monitoring events were conducted for the J-1 Range southern plume in October 2011. Water level data collected during a synoptic round on 24 October 2011 were collected in accordance with those wells identified in Table 1-2. The total number of wells gauged in October 2011 was 50. Although not part of the formal hydraulic monitoring program, water level elevations were obtained from well 537-0107 located within MMR near the J-1 Ranges, which has a pressure transducer/datalogger installed, and measurements are recorded every 15-minutes by the US Geological Survey (USGS) (http://groundwaterwatch.usgs.gov/awlSites.asp?S=414159070310501). The data from well 537-0107 collected on 24 October 2011 was used as an additional control point in the contouring process with the other, manually collected data from the October 24th synoptic round and is included in Table 4-1. Table 4-1 contains water level data collected prior to and post-startup conditions.

4.2 J-1 Range Southern Groundwater Level Analysis

Water level measurements collected on 24 October 2011 were analyzed for potential data anomalies and errors. Two wells appeared to be inconsistent with neighboring measurements: MW-483M1 and MW-528M1. The groundwater elevation obtained from these wells, 72.09 and 72.67 feet mean sea level (msl), respectively (Table 4-1), plot approximately 0.3 feet below the regional trend based on the potentiometric contour map (Figure 4-1). This trend is similar to observations made in 2010 for MW-528M1 and may be due to local geologic conditions. Well MW-483M1 is located generally under the infiltration trench zone, and may have been subject to measurement error. After further evaluation of the water level data, a maintenance survey (resurvey) has been scheduled to be performed before December 31, 2012 on the following wells: J1SEW0001 stilling tube (on-base extraction well), MW-398M2, MW-483M1 (infiltration trench), MW-488PZ, and MW-528M1.

The water level data across the J-1 Range southern area measured on the 24 October 2011 synoptic event ranged from 73.59 feet msl at 537-0107 on the J-1 Range to 70.70 feet msl at 90WT0010, located off-base near Route 130 in the southern end of the gauging network and included a measurement from extraction well J1SEW0001 (72.70

ft msl) which was on-line when the synoptic measurements were collected. The horizontal gradient calculated across the J-1 Range Southern gauging network (537-0107 to 90WT0010) was approximately 0.00055 feet per foot (ft/ft). The on-base gradient from 537-0107 to MW-398M2 (72.55 ft msl) measures approximately 0.0004 ft/ft. This is in comparison to the site-wide hydraulic gradient of 0.0006 ft/ft measured on 8 November 2010 (USACE 2011) with an on-base gradient of approximately 0.0004 ft/ft.

Water levels from monitoring wells expressed as elevations in feet msl, having mid-screen elevations between approximately 66 to -31 feet msl, were used to produce the groundwater potentiometric map for the 24 October 2011 synoptic event and are depicted in Figure 4-1. Wells with mid-screen elevations outside this range were deemed less useful for this purpose and were not used in the contouring process. The water level from monitoring well MW-483M1 was excluded from contours presented on Figure 4-1 as this well is underneath the recharging infiltration trench and is not interpreted to be representative of regional water levels due to the potential influence of the trench on local water levels. Sufficient well control exists such that excluding this well from the contouring did not affect development of Figure 4-1. The potentiometric analyses were aided by using SURFER (Version 9), a geo-mapping software package. The 2-D kriging algorithm method was applied for data interpretation and the average value was used if multiple data points were in the same grid.

As shown in Figure 4-1, the regional groundwater flow direction, based on water level measurements at the interval from 66 to -31 feet msl, is northwest to southeast with convergent flow near the extraction well due to the hydraulic stress of pumping. The flow field converges near the extraction well, reflecting inward horizontal hydraulic gradients for the interval.

4.3 J-1 Range Southern Seasonal Groundwater Level Changes

The 24 October 2011 water level data were compared with the 8 November 2010 water level measurements to determine seasonal changes in water levels and identify potential trends. The effects of the extraction system were excluded from the analysis as there may have been minor variability in the flow rates between gauging events and the increase in water levels has a slight impact on aquifer transmissivity, and a subtle effect on capture zone dimensions, compared to the change in the hydraulic gradient.

Table 4-2 presents the water level measurements for the current reporting period and prior synoptic rounds. Figure 4-2 presents contours of the water level changes between the 8 November 2010 and 24 October 2011 measurements. Water levels from these monitoring wells have mid-screen elevations between approximately 66 to -31 feet msl. Only those wells at each well cluster location that were used in the contouring program are shown on Figure 4-2. Water level changes from the extraction well (J1SEW0001) and monitoring wells MW-398M2, MW-483M1, and MW-488PZ were excluded from the assessment as these wells are located proximate to the extraction well and their data is interpreted to be subject to pump fluctuations and not indicative of seasonal changes between annual synoptic water level measurement rounds. Sufficient well control exists to contour annual water level changes across the J-1 Range southern site as shown in Figure 4-2.

The magnitude of water level change was generally greatest in the northern portions of the site. Water levels near the Top of Mound (TOM) decreased by over 1 foot from water levels measured in November 2010 (537-0107 & BH70-A) while measurements in the southern portion of the site decreased by approximately 0.75 feet over the same reporting period (Figure 4-2). In comparison, water levels measured between 4 November 2009 and 8 November 2010 were in an increasing trend ranging from approximately 2 feet in the southern portion, to over 3 feet in the northern portion, of the J-1 Range Southern site.

As presented in Figure 4-3, water levels are monitored by USGS on a daily basis at three on-base wells (MW-126S, 537-0107, MW-145S) and one off-base well (90MW0063), which are all located in close proximity to the J-1 Range and other southeast range sites. The data indicate that between November 2009 and November 2010 water levels passed through a groundwater high in July 2010 and have been on a decline near the TOM. An annual high of smaller magnitude occurred in July 2011, but the water level data resumed a regional trend of declining levels from approximately mid-July 2011 to the end of the December 2011 reporting period. These data seem to indicate that when water levels are on a decline near the TOM the magnitude in water levels changes are greater on-base (e.g., in proximity to MW-131S) than off-base (e.g., in proximity to 90WT0010).

Water levels above 74 feet msl were measured in USGS wells in July 2011 (Figure 4-3). This is in comparison to water levels being slightly above 76 feet in 2010, and approximately 73 feet at the end of 2011. Assuming a 2011 saturated thickness of 93.5 feet at the extraction well, a three foot decrease in water levels represents a 3 % change in saturated thickness and a slight decrease in aquifer transmissivity. Based on the water level data collected during the November 2010 and October 2011 synoptic water level rounds, the on-base hydraulic gradient upgradient of the extraction well (from 537-0107 to MW-398M2) was unchanged, and measured approximately 0.0004 ft/ft. The off-base hydraulic gradient in October 2011, as measured between monitoring wells MW-482M2 and 90WT0010 on Figure 4-1, measured approximately 0.00073 ft/ft. In comparison, the off-base hydraulic gradient in November 2010 measured approximately 0.00086 ft/ft. The effects of the changes in saturated thickness and hydraulic gradient are discussed further in Section 4.4.

4.4 J-1 Range Southern System Performance Evaluation

To delineate the capture zone of the on-base portion of the RDX plume for the single in-plume extraction well (J1SEW0001), the analytical solution of Javandel and Tsang (1986) was applied by using site-specific parameters. The Javandel and Tsang (1986) method is an analytical solution suitable for a fully penetrating well in an isotropic aquifer.

The capture zone of a single pumping well can be defined using the following equation (EPA 2008):

$$Y = \pm Q/(2Ti) - Q/(2\pi Ti) \tan^{-1}(Y/X)$$

Where:
T = aquifer transmissivity (aquifer thickness (or pumping well screen length) * aquifer hydraulic conductivity)

i = regional flow gradient
Q = well discharge rate
X = distance along flow direction
Y = distance perpendicular to flow direction

For various Q/Ti values, a series of capture zone curves can be developed where the higher the Q/Ti value, the larger the capture zone.

In the vicinity of the J1SEW0001 area, the average hydraulic conductivity is approximately 200 feet/day. A regional hydraulic gradient of 0.0004 feet per foot (ft/ft) was measured in November 2010 and also October 2011for the on-base portion of the plume. The aquifer thickness in October 2011 is estimated at 93.5 feet based on site conditions. For this calculation, aquifer thickness was assumed to be the vertical distance from the water table (approximately +73.5 ft msl at the TOM) to the top elevation of significant units with low hydraulic conductivity (approximately -20 ft msl).

Based on an extraction rate of 45 gpm, the capture zone of the J1SEW0001 extraction well was calculated to range from approximately 579 feet wide at the extraction well to 1,000 feet wide at 1,100 feet upgradient of the extraction well. The calculated stagnation point is approximately 184 feet downgradient of the extraction well. The analytically calculated capture zone is wider than that of the observed RDX plume, which measures less than 200 feet wide immediately upgradient of the base boundary, and is about 350 feet at its widest point in the vicinity of MW-528M1 (Figure 5-1) The comparative analysis of the analytically calculated capture zone and the observed width of the RDX plume demonstrates that the ETI system is effectively capturing the on-base portion of the J-1 Range southern plume.

Capture zone analysis using the three-dimensional numerical modeling approach is provided in Section 6.0. Use of numerical modeling for capture zone estimation is consistent with EPA guidance (EPA 2008).

5.0 CHEMICAL MONITORING

Two rounds of chemical sampling were completed at J-1 Range southern in 2011. Thirteen wells were sampled during the regular semiannual J-1 Range southern effort in May 2011. The complete 30-well monitoring network (Table 1-1), was sampled during the annual effort in October and November 2011. Samples were collected and analyzed in accordance with the monitoring plan (ECC 2007a) and subsequent revisions made in the 2008, 2009 and 2010 annual J1 Range reports (ECC 2009; USACE 2010, 2011). Sample collection procedures including field monitoring equipment calibration and maintenance were conducted in accordance with the provisions of the *Draft Generic Quality Assurance Project Plan* (ECC 2007c). J-1 Range southern chemical monitoring well results for the 2011 reporting period are presented Table 5-1.

5.1 Contaminant Extent 2011

There were no new wells or drive points installed nor any deviations from the J-1 Range southern sampling plan. The last intrusive activities occurred between March and April 2010, when additional groundwater data were obtained from eight drive points (DP-543 through DP-550), which helped to further define the nature and extent of RDX contamination (Figure 5-1). This 2010 drive point groundwater data was used in conjunction with 2011 chemical monitoring well data to contour the observed RDX plumes to interpret the nature and extent of the RDX plume as of November 2011 (Figure 5-1).

Figure 5-1 shows the location of two cross-sections that present the updated vertical extent of RDX contamination generally parallel (Line A-A'; See Figure 5-2) and perpendicular (Line B-B'; See Figure 5-3) to the regional groundwater flow direction as of November 2011.

The on-base portion of the RDX plume currently measures approximately 1,200 feet long and is about 350 feet wide at its widest portion in the vicinity of MW-528M. The on-base portion of the RDX plume terminates at the base boundary due to effective capture and treatment by the ETI system. The downgradient portion of the J-1 Range southern plume is assumed to be detached from the on-base portion as a result of the operation of the RRA system, and measures approximately 1,600 feet long and 700 feet at its widest point in the vicinity of MW-522. The on-base portion of the plume measures approximately 40 feet thick at its thickest point, with contamination extending from the water table near MW-360, to approximately 60 feet below the water table at the base boundary. The off-base plume is approximately 45 feet thick at its thickest point, with the RDX contamination beginning approximately 50 feet below the water table at its upgradient most extent near monitoring well location MW-481, to approximately 80 feet below the water table downgradient near MW-522.

5.2 Contaminant Monitoring Trends

Appendix B contains inception to date results for RDX at monitoring wells that are part of the J-1 Range southern chemical monitoring network (Table 1-1). The data were compared to past monitoring results, and notable observations and trends are presented in the following discussion. Graphs depicting trends of RDX concentrations for selected groundwater monitoring wells, along with annual maximum concentrations of RDX

detected in 2011 and the interpreted extent of the RDX plume as of November 2011, are presented on Figure 5-4.

Near the source area of the plume at MW-360M2, RDX was detected at 2.3 µg/L in May 2011 and 0.25J µg/L in November 2011, which reflects a decreasing trend compared to the spikes observed, (9.0 µg/L in April 2010 and 6.1 µg/L in November 2010 , see Table 5-1). The 9.0 µg/L concentration represented a historical maximum for this well and may be attributed to source excavation activities that occurred in 2009 (Figure 5-4). Downgradient of MW-360M2, concentrations within the plume at MW-528M1 dropped from 1.2 µg/L in May 2011 to 0.41 µg/L in November 2011. At DP-389, which is positioned deeper in the aquifer at this location, RDX was non-detect in October 2011.(Figure 5-2). During the previous monitoring period, RDX was reported at 0.16 J µg/L in DP-389 (Appendix B). These results indicate that the vertical extent of the plume on-base is adequately defined and that discontinuous higher concentration plumelets are migrating toward and being captured by the extraction well J1SEW0001.

RDX concentrations along the base boundary (DP-379, MW-488M1, MW-398M1 and M2, MW-483M1) were non-detect (ND) in 2011. At MW-488PZ RDX was detectable at a concentration of 2.7 µg/L in October 2011, which represented the second annual round of measurable RDX at this screen location (0.98 µg/L, December 2010; ND, April 2010). Otherwise , historical results for MW-488PZ from April 2008 to April 2010, were all non-detect for RDX. As explained in Section 4.4 and Section 6.3 of this report, capture zone analysis indicates that MW-488PZ, which is screened at an interval similar to MW-398M2 and the upper part of the extraction well screen, is within the capture zone of the extraction well. Well MW-488M1, which is screened at an elevation comparable to the lower part of the extraction well screen, was ND in October 2011 and has been ND since May 2007 except for one detection of 0.25 µg/L in September 2007 (Appendix B). The generally historical absence of detectable RDX at the installation boundary since the extraction well was activated in October 2007 is most likely due to the operation of the extraction well drawing in sufficient clean water from outside the plume at the current extraction rate of 45 gpm. Except for the anomalous 3.08 µg/L concentration measured in May 2010, influent concentrations from extraction well J1SEW001 remained relatively steady, varying between 0.292 µg/L and 0.524 µg/L during the 2011 reporting period (Table 3-2), compared to between 0.268 µg/L and 0.479 µg/L during the 2010 reporting period. These values are slightly less than those measured during the 2009 monitoring period where concentrations varied from 0.448 µg/L to 0.544 µg/L at the optimized flow rate of 45 gpm.

Along Windsong Road (lateral cross-section line B-B' in Figure 5-1), RDX concentrations vary from ND on the southwestern end at MW-480M2 and MW-481M2, to 1.0 µg/L in May 2011 and 1.7 µg/L in November 2011 at MW-482M2. The results are generally consistent with previous years on the northeastern perimeter of upgradient off-base plume (MW-482M2), and indicate a continued decreasing trend of concentrations on the southwestern perimeter (MW-481M2). The distribution of concentrations reported in wells located along B-B', and profile samples from the eight drive points installed in 2010, suggest the plume core is located between MW-481M2 and MW-482M2 in the vicinity of DP-545 (Figures 5-1 and 5-3). RDX concentrations detected in 2010 in some of the profile samples for drivepoint DP-546 (2.8 ug/L), which were interpreted to indicate the presence of a low concentration plumelet in the vicinity of Windsong Road, were migrated downgradient for the updated interpretations of the observed plume and cross-

sections (Figure 5-1 and Figure 5-3) based on the average groundwater velocities and interpretted RDX attenuation for the site.

A separate RDX plumelet is interpreted to exist in the vicinity of drivepoint DP-546 based on the 2010 profile performed at this location where 2.8 ug/L of RDX was detected at the -27.5 to -32.5 feet msl interval. The observed concentration gradients on the east side of the off base plume are interpreted to not support the presence of an eastern bulge of the RDX plume to connect the main plume at MW-482M2/M3 to the plumelet at DP-546. It should be noted that the capture zone for the new off base extraction well J1SEW0002 is predicted to encompass the entire plumelet at DP-546 (IAGWSP, 2011, Final Project Note, Figure 3, September 29, 2011).

Further downgradient in the off-base plume, the lateral extent of RDX is well defined by ND values for explosives in peripheral wells to the west in MW-521M1 and MW-523M1, and to the east by drive points DP-543 and DP-550 sampled in 2010.

The leading edge of the off-base plume is well defined by ND values in wells to the south including MW-527M1, MW-526M1, MW-525M1/M2, MW-402M1/M2, MW-400M1/M2, and MW-403M1/M2, and primarily ND values detected in 2010 in drive point DP-544 with one sub-0.6 ug/L detection in this profile (0.20 ug/L at the -47.53 to -52.53 feet msl interval) in the vicinity of Little Acorn Lane (Figure 5-1 and Figure 5-4).

The core of the off-base plume (Figure 5-2 and Figure 5-4) is interpreted to be defined by concentrations reported in MW-524M1 (76.1 ug/L, May 2011; 55.7 ug/L, November 2011), and profile samples collected in 2010 at DP-545 (43 ug/L), and DP-549 (74 ug/L). Based on recently measured data the RDX plume core above 20 ug/L is likely trending along Grand Oak Road, and the plume downgradient leading edge limit as defined by the 0.6 ug/L isopleths is still on the northwest side of Little Acorn Lane.

The furthest downgradient detection of RDX in 2011 was 0.47 µg/L in MW-403M1 in November 2011, which historically has been ND since its first sampling in November 2005 (Appendix B). The well with the furthest downgradient detection of RDX, MW-402M2, that was measured in 2010, had ND for RDX in both semi-annual rounds in 2011. The 2011 data supports the interpretation that the limit of the RDX plume, does not appear to extend downgradient of Little Acorn Lane (Figure 5-1).

5.3 Other Explosives

In addition to RDX, analysis for 18 additional explosive compounds was undertaken using EPA Method 8330. HMX was detected in groundwater samples collected from MW-360M2, MW-488PZ, MW-524M1, and MW-528M1. Reported concentrations ranged from 0.24 µg/L µg/L to 8.4 µg/L . HMX was not observed in extraction well influent samples collected monthly in 2011 (Table 3-2). HMX is not a contaminant of concern at this site, all reported concentrations are below the EPA health advisory (400 µg/L) and it does not affect the ETI system design objectives nor impact treatment train effectiveness.

6.0 GROUNDWATER MODELING

Various modeling tools were used to evaluate the performance of the J-1 Range southern ETI system. The model prediction of the RDX distribution from the most recent J-1 Range southern flow model (ECC 2009) and plume shell developed for the Final J-1 Range RI/FS (ECC 2010) was compared to the observed plume conditions through 2011 to assess the performance of the ETI system against design predictions. Modeling predictions were also compared to the observed influent concentrations and mass removal.

6.1 Model-Predicted Versus Observed Influent Concentrations and Mass Removal

Modeling-predictions of extraction well influent RDX concentrations were compared to the observed treatment plant influent concentrations and mass removal using the 2009 J-1 Range southern flow model (ECC 2009), and the 2009 plume shell developed for the Final J-1 Range RI/FS (ECC 2010) which incorporated profile and monitoring well data through December 2009. For simulations through the end of 2011 period, flow rates for other extraction and infiltration systems within the model domain were updated for systems in proximity to the J-1 Range southern plume area, such as FS-12, J-2, and J-3 Range. Pumping histories for wells within the model domain were obtained from Air Force Center for Environmental Excellence (AFCEE) and the Impact Area Groundwater Study Program (IAGWSP).

Modeling activities consisted of evaluating model-predicted concentrations and mass capture at the location of the extraction well J1SEW0001. The evaluation was conducted by comparing model-predicted results to observed results. These evaluations were conducted to:

- Identify areas where the model-predicted and observed concentration differences and trends could be used to highlight potential problem areas that may not have been included in the contaminant plume shell or that are being remediated more quickly than initially modeled, and

- identify potential opportunities to optimize system flow rates.

Observed RDX mass removal at the treatment plant was determined using measured influent concentrations through 5 December 2011 to calculate mass removal through 29 December 2011. In the transport model, the J-1 Range southern RDX plume shell simulated water being extracted at a rate of 45 gpm during the 2011 reporting period.

Both the model and measured influent concentrations depict a downward trend, with simulated concentrations during the reporting period being approximately half the measured concentrations (Figure 6-1 – top pane). Both the model and measured influent concentrations showed a slight trend of increasing concentrations with observed concentrations increasing by approximately 50%, and modeled influent concentrations increasing by approximately 20% since the end of the prior reporting period (2010).

In 2011, the new 2009 plume shell coupled to the 2009 flow model predicted that approximately 0.044 pounds of RDX would be removed from the aquifer compared to 0.077 pounds measured at the system. The model simulated and measured RDX mass

removal curves are presented in Figure 6-1 (bottom pane). The slopes of the two curves are similar for reporting year 2011. The simulated mass removed prior to 2010 was determined based on the 2007 plume shell and the predicted mass removed from 2010-2011 was determined using the revised 2009 plume shell. The similarity in mass removal between the predicted removal vs. the observed removal for 2010-2011 indicates that the new plume shell better simulated the contaminant distribution upgradient of the extraction well than the prior plume shell. Figure 6-2 shows the model simulated RDX plume compared to observed conditions through November 2011. With the exception of RDX detected in MW-360M2 above 0.6 µg/L in May 2011, as the current plume shell does not consider a continuing source, the new plume shell simulates on-base conditions quite well.

The off-base RDX contaminant plume shapes are very similar (model predicted vs. observed), however, the plume direction differs slightly as shown in Figure 6-2. The notable difference is that contamination was detected in well MW-524M1 at 76.1 µg/L in May 2011 and 55.7 µg/L in November 2011, which resulted in the addition of a 20-200 µg/L RDX contour to the observed plume (Figure 6-2 right pane). Profile samples collected from MW-524 in November 2009 did not detect the presence of RDX above 2 ug/L. The 20-200 ug/L contour is not predicted by the 2009 plume shell (Figure 6-2 left pane). J-1 Range southern chemical monitoring results observed at each groundwater chemical monitoring location for the 2011 reporting period vs. predicted by the groundwater transport model are presented in Table 6-1. The overall off-base plume direction is observed to be more to the east of the predicted plume direction, being tracked along Grand Oak Road (Figure 6-2).

Profile results obtained from DP-549 (Figure 5-1) installed in April 2010 (post-plume shell development) detected RDX at 74 µg/L. Similarly profile results collected from DP-545 located approximately 300 feet upgradient and in proximity to Grand Oak Road detected RDX at 43 µg/L in March 2010. Model results using the revised plume shell simulated concentrations of approximately 20 µg/L in close proximity to these profile results during this 2011 reporting period. Based on measured data the core of the RDX plume above 20 µg/L is wider than simulated and it extends further to the east along Grand Oak Road, and observed core concentrations exceeding 20 ug/L occur along Grand Oak Road in the vicinity of MW-524M1.

6.2 Model-Predicted Capture Zones

The 2009 J-1 Range southern flow numerical model (ECC 2009), which was calibrated to 2003 heads conditions (ECC 2009), was used to delineate the capture zone for the extraction well J1SEW0001 under steady-state pumping conditions of the J-1 Range ETI system. The capture zone developed by the numerical model based on the steady-state pumping stresses at J-1 Range southern and adjoining systems (J-3, J-2, and FS-12) were accounted for in the numerical model. The numerical model considers the cumulative effects of partial well penetration within the aquifer, variable recharge rates, and injection wells/infiltration trenches. Aquifer stresses for average recharge conditions which consisted of the regional model calibrated to 2003 (no J-1 Range southern ETI system) water levels with recharge of 32 inches/year, were simulated considering 2011 steady-state injection/extraction rates and produced a water table with an elevation of approximately 68.5 ft msl at the TOM, and a hydraulic gradient of 0.00033 ft/ft upgradient of the extraction well similar to the 4 November 2009 measured

gradient conditions (0.00035 ft/ft) prior to the recent high water table conditions observed in 2010. The capture zone width measured approximately 550 feet at the extraction well, with a simulated stagnation point of approximately 140 feet downgradient of the well when a pumping rate of 45 gpm was simulated. The model simulated capture zone is presented in Figure 6-3 under the average water table conditions. The model-predicted capture zone dimensions compare closely to the capture zone predicted using the analytical method EPA 2008 approach, where the capture zone width was calculated to be 579 feet at the well (Appendix A).

As a result of the aforementioned analysis, under both scenarios (analytical calculations and numerical model) the plume upgradient of the base-boundary, as currently depicted, is being contained under existing operational conditions both laterally and vertically.

7.0 RECOMMENDATIONS FOR SYSTEM MONITORING AND OPERATIONS

Presently, there is no recommendation to further modify the J1SEW0001 system flow rate of 45 gpm.

7.1 System Operational Recommendations

The J-1 Range southern ETI system has operated as anticipated based on in-plant analytical results. As a result, no changes are recommended to the current system operating procedures.

Following the system startup and evaluation of hydraulic and chemical monitoring network data for the new off-base extraction well J1SEW0002, a revised environmental monitoring plan will be submitted to optimize tracking of plume migration/cleanup.

7.2 Wellfield Recommendations

Analytical calculations for a single well capture zone combined with numerical model simulations using current system stresses under average recharge and water table conditions indicate that 45 gpm is sufficient to capture the J-1 Range southern plume at the MMR boundary both horizontally and vertically. This flow rate will be re-evaluated in the next annual report.

7.3 Hydraulic Monitoring Network Recommendations

There are no recommended changes to the hydraulic monitoring program. Table 7-1 indicates those wells that will be measured in the annual synoptic gauging round (Fall 2012).

However, as indicated in Section 4.2, the water level for MW-483M1 and MW-528M1 were approximately 0.3 feet below the regional trend (Figure 4-1). As indicated in Section 4.3, certain wells in close proximity to the extraction well were excluded from the map of annual water level changes due to likely influences from the extraction/infiltration system on local water levels (Figure 4-2). After further evaluation of the water level data, a maintenance survey (resurvey) has been scheduled to be performed before December 31, 2012 on the following wells: J1SEW0001 stilling tube (on-base extraction well), MW-398M2, MW-483M1 (infiltration trench), MW-488PZ, and MW-528M1.

7.4 Chemical Monitoring Network Recommendations

Due to the consistency of water quality trends in monitoring wells and planned future construction of the off-base leading edge extraction well (J1SEW0002) on Grand Oak Road and resultant new off-base capture zone, the following changes to the chemical monitoring network are recommended, and presented in Table 7-2:

- Reduce sampling frequency to annually (Fall) for monitoring wells MW-360M2, MW-481M2, MW-482M2, MW-522M1/M2, MW-525M1/M2, MW-526M1, and MW-527M1.

- Increase sampling frequency to semi-annually for leading edge wells MW-400M1/M2, MW-402M1, and MW-403M1.

The approved changes to the monitoring well network for wells to be sampled annually (Fall) and semiannually (Spring and Fall), are described in the Project Note (included in Appendix C).

8.0 REFERENCES

ECC, 2010 (July). *Final J-1 Range Remedial Investigation/Feasibility Study*. Prepared by ECC for U.S. Army Corps of Engineers, New England District, Concord, MA. (Environmental Data Management System (EDMS) Document ID 038456)

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Javandel, I., and Tsang, C., 1986, Capture-zone type curves: A tool for aquifer cleanup. *Ground Water* 24(5): 616-625

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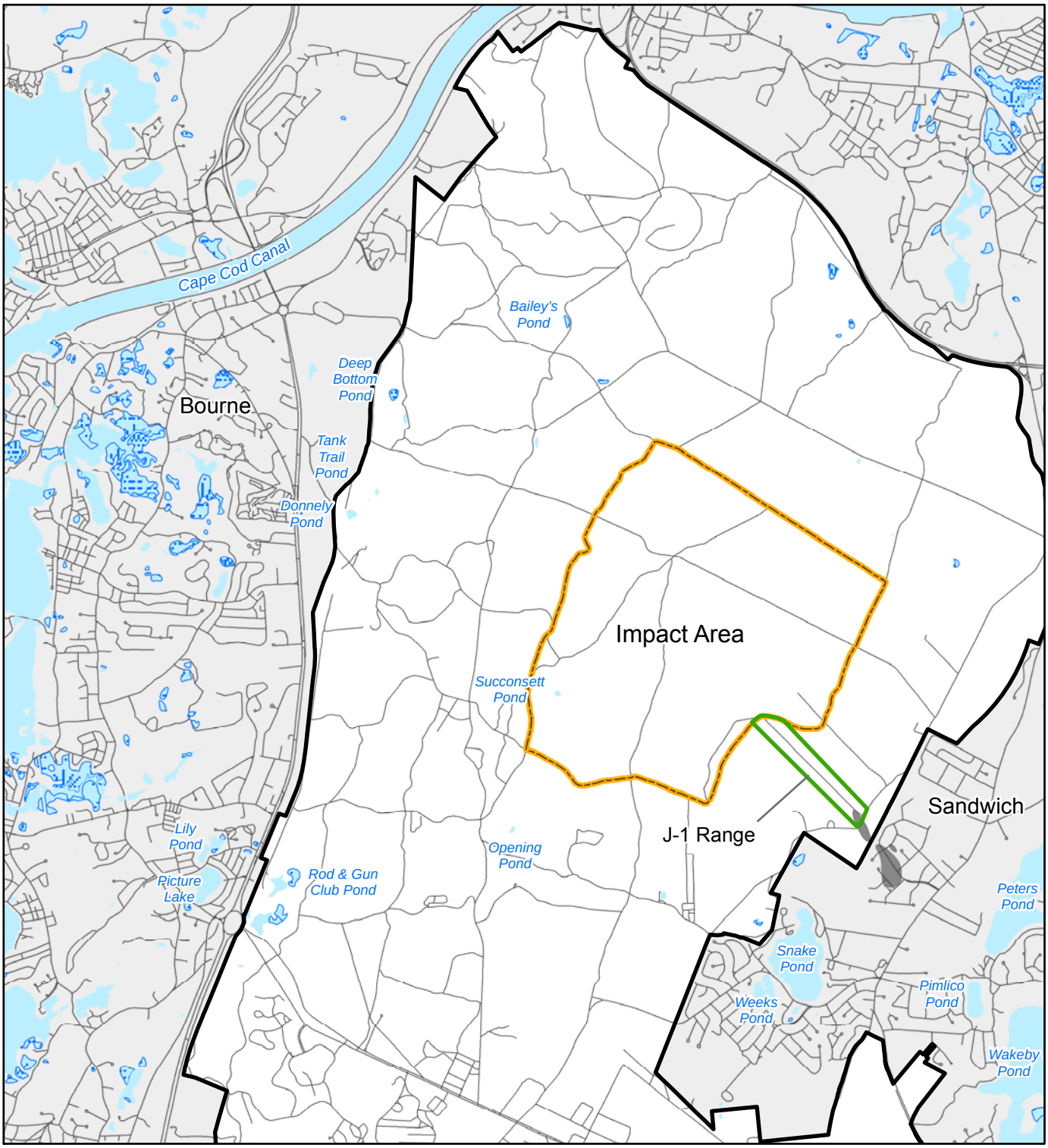
USACE, 2011 (September), *Final J-1 Range Northern and J-1 Range Southern Annual 2010 Environmental Monitoring Report*. Prepared by U.S. Army Corps of Engineers, New England District, Concord, MA. (EDMS ID 112072)

FIGURES

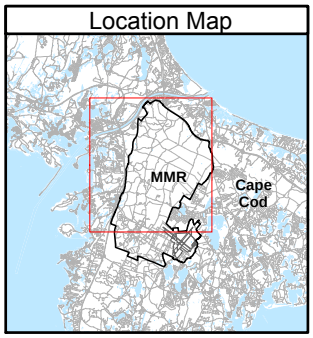


Legend

- MMR Boundary
- Impact Area Boundary
- J-1 Range Southern RDX Plume (shown to 0.6 µg/L)

Plume through November 2011

Location Map



0 2,500 5,000 Feet

US Army Corps of Engineers
New England District

Location of J-1 Range Southern

FIGURE 1-1

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May 31, 2012 DWN: MTW CHKD: CJK

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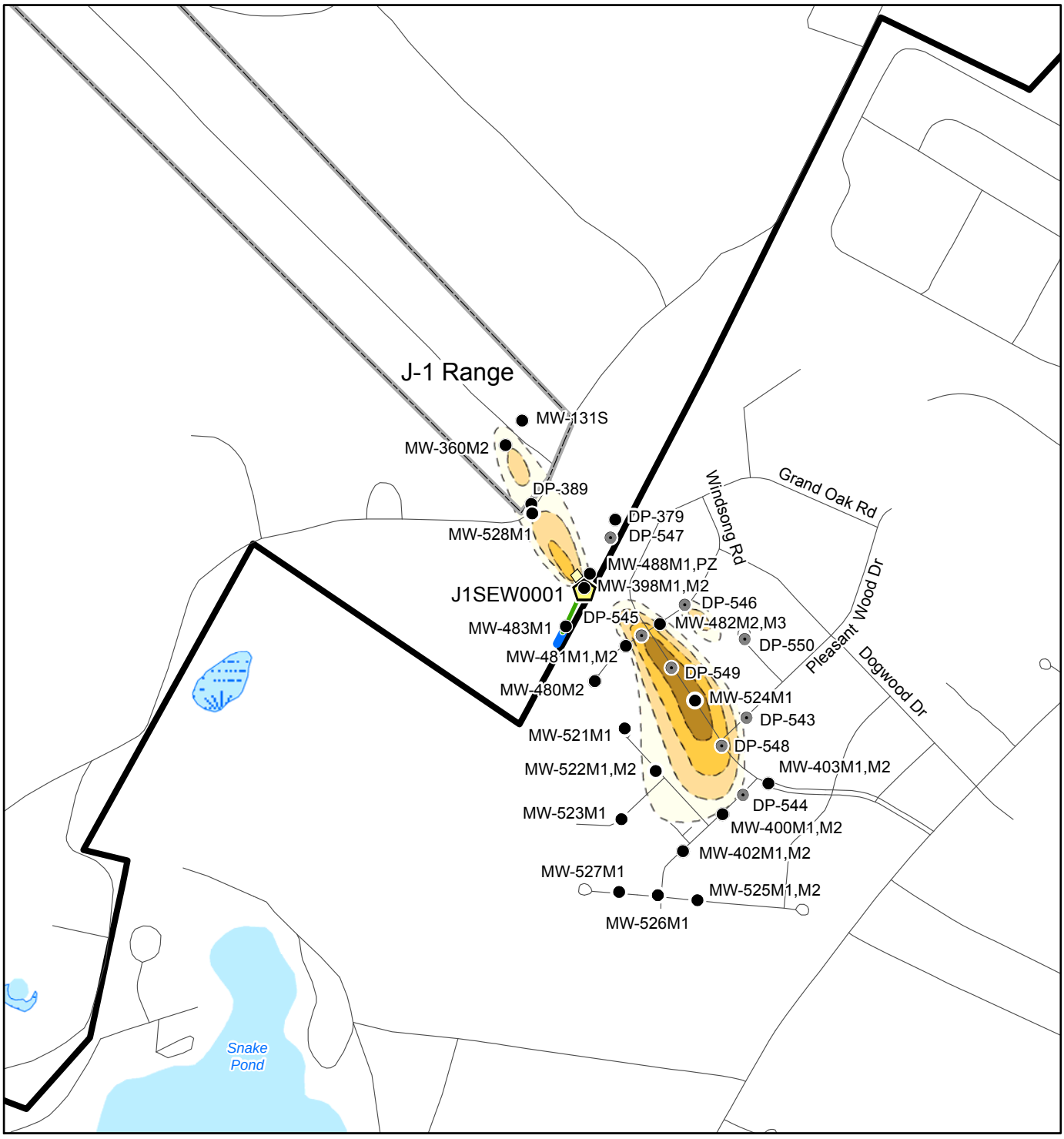


Legend

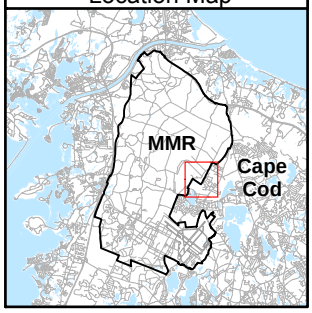
- Drive Point - 2010
- Monitoring Well
- Extraction Well
- Effluent Piping
- Infiltration Trench
- Treatment System
- J-1 Range Boundary
- MMR Boundary

RDX Detections

- 0.6-2 µg/L
- 2-6 µg/L
- 6-20 µg/L
- 20-200 µg/L

Plume through November 2011

Location Map



N

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TITLE

J-1 Range Southern Chemical Monitoring Network

US Army Corps of Engineers
New England District

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FIGURE 1-2

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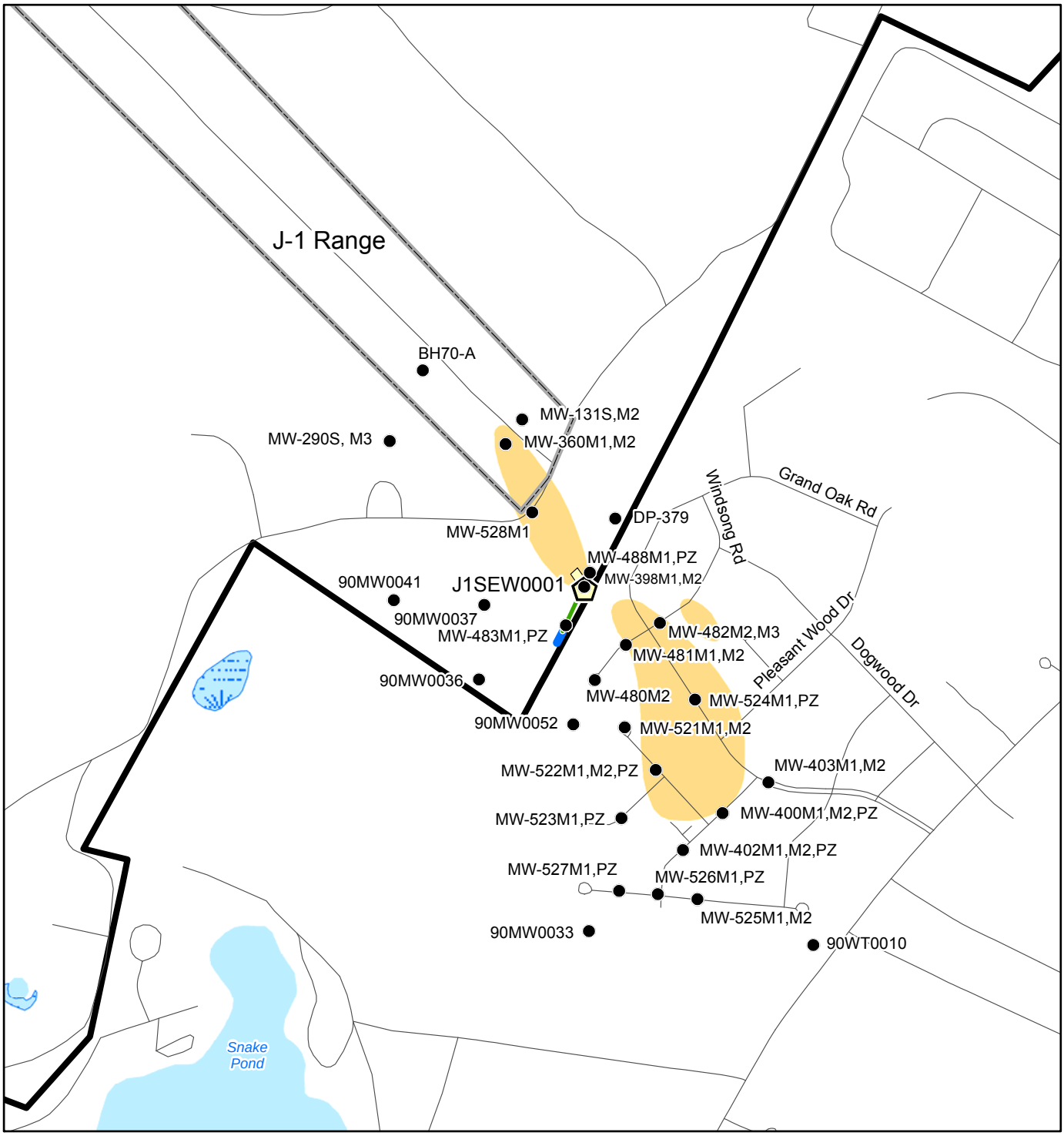
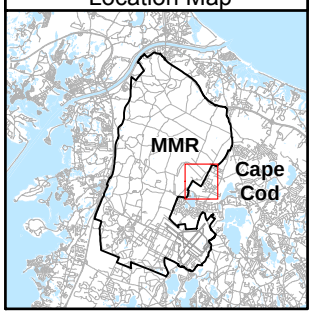


Legend

- Monitoring Well
- Extraction Well
- Effluent Piping
- Infiltration Trench
- Treatment System
- J-1 Range Boundary
- MMR Boundary
- RDX Plume (shown to 0.6 µg/L)

Plume through November 2011

Location Map



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TITLE

J-1 Range Southern Hydraulic Monitoring Network

US Army Corps of Engineers
New England District

Impact Area Groundwater Study Program

FIGURE 1-3

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June 26, 2012 DWN: MTW CHKD: CJK

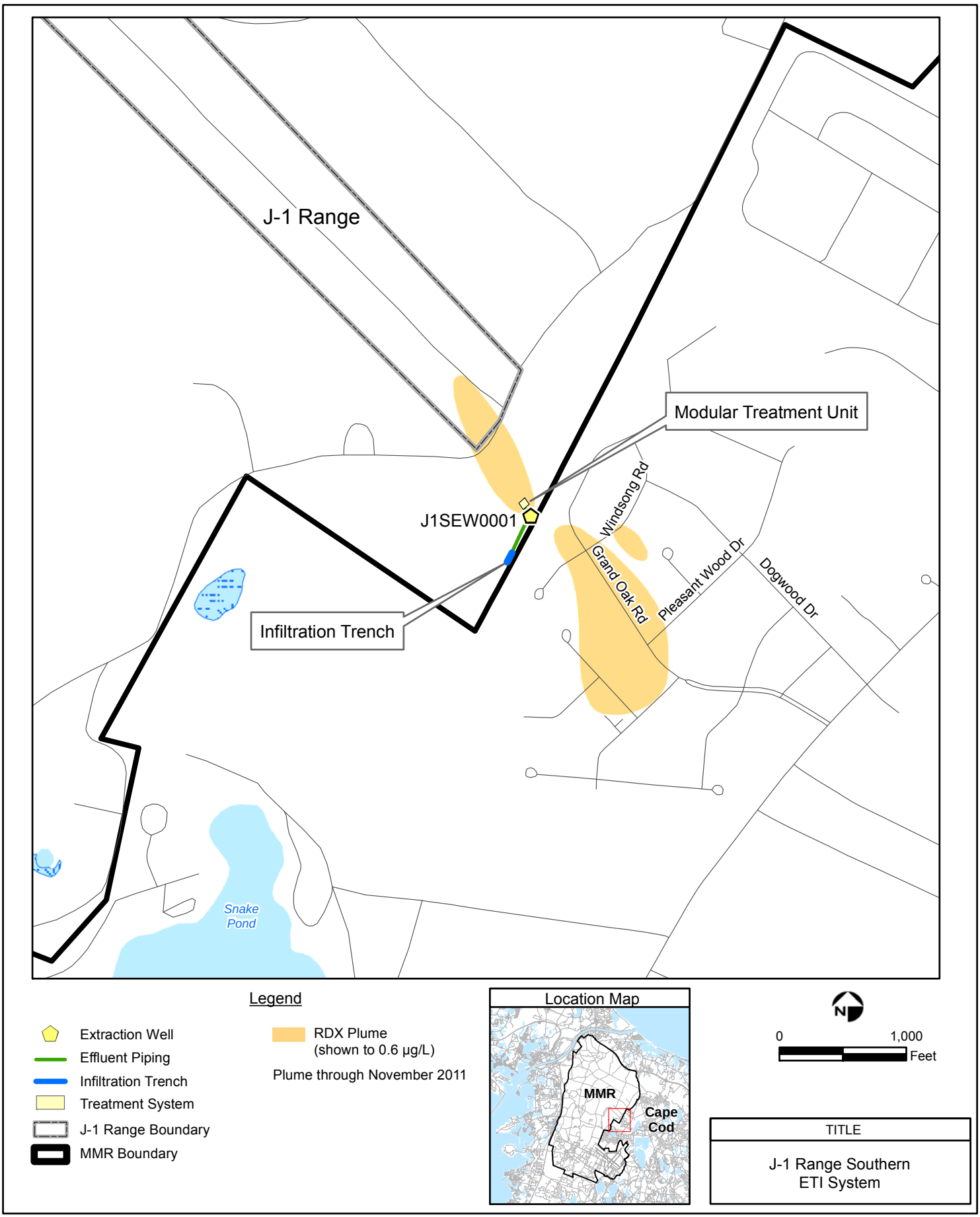

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FIGURE 2-1

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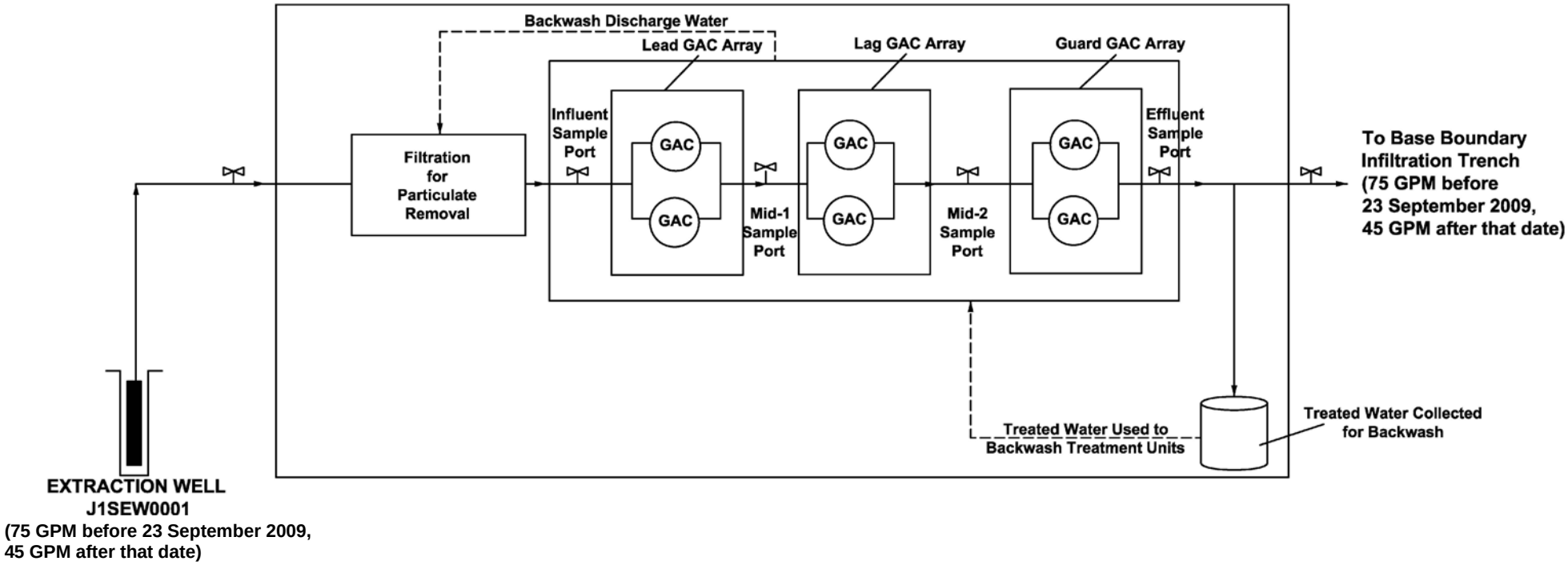

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GAC - Granular Activated Carbon

GPM - Gallons Per Minute

TITLE
J-1 Range Southern Modular Treatment Unit Process Flow Diagram

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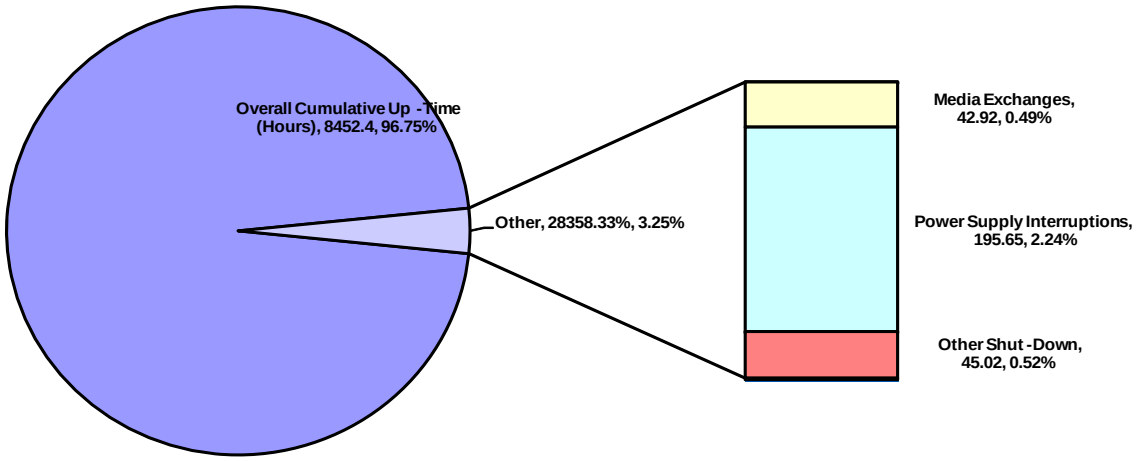
June 7, 2012 DWN: MTW CHKD: CJK

Impact Area Groundwater Study Program

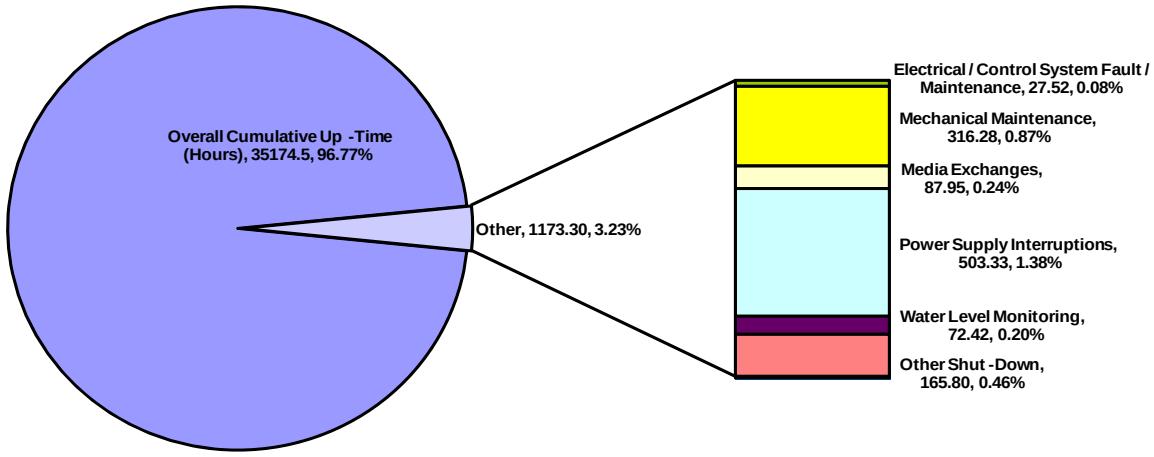
FIGURE 2-2

Figure 2-3
Downtime by Category
J-1 Sourthern Range Groundwater Treatment System

a. Downtime January 2011 through December 2011



b. Downtime Since Remedy Startup (October 2007)



- Electrical / Control System Fault / Maintenance
- Mechanical Maintenance
- Media Exchanges
- Power Supply Interruptions
- Water Level Monitoring
- Other Shut-Down
- Aquifer Recovery
- Overall Cumulative Up -Time (Hours)

Downtime by Category J-1 Range Southern ETI System Inception to Date

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June 19, 2012 DWN: MTW CHKD: CJK

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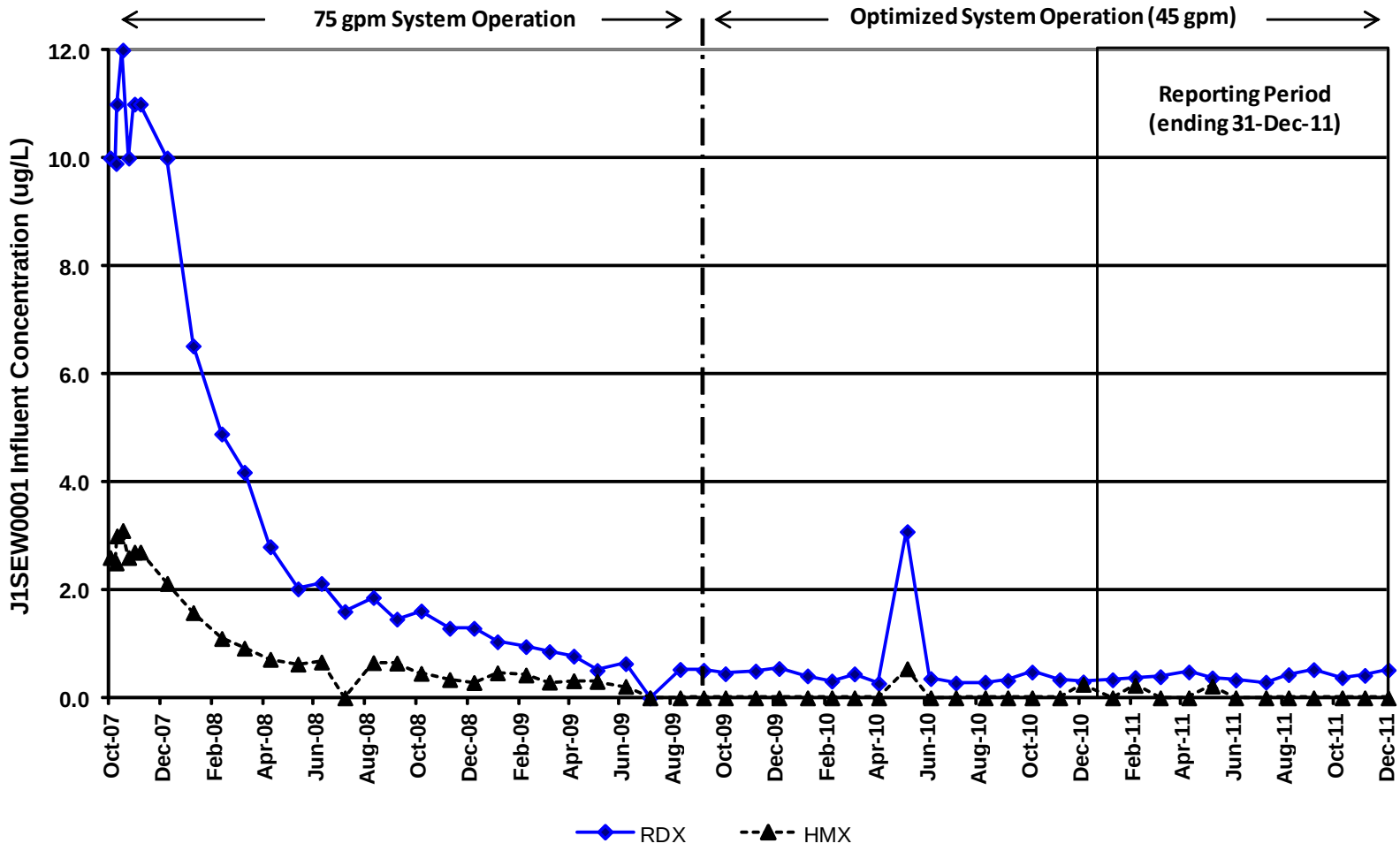
New England District

Impact Area Groundwater Study Program

FIGURE 2-3

Figure 3-1
Influent Contaminant Concentrations Since Start-up
J-1 Range Southern Groundwater Treatment System



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TITLE
Influent Contaminant Concentrations J-1 Range Southern ETI System

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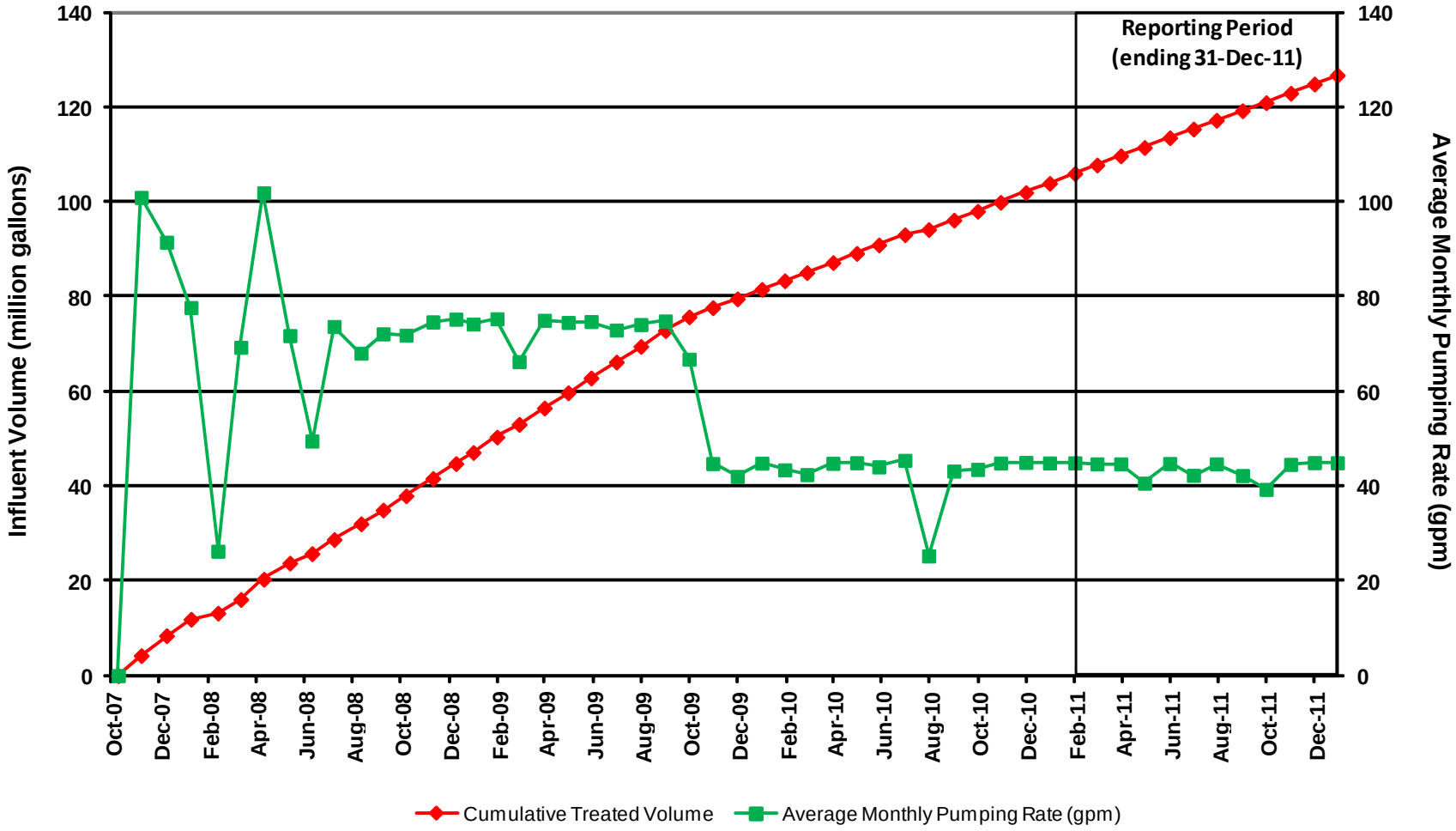
August 21, 2012 DWN: MTW CHKD: CJK

Impact Area Groundwater Study Program

FIGURE 3-1

Figure 3-2
Total Groundwater Volume Treated Since Startup
J-1 Range Southern Groundwater Treatment System



US Army Corps of Engineers
New England District

TITLE
Total Groundwater Volume Treated Since Startup J-1 Range Southern RRA ETI System

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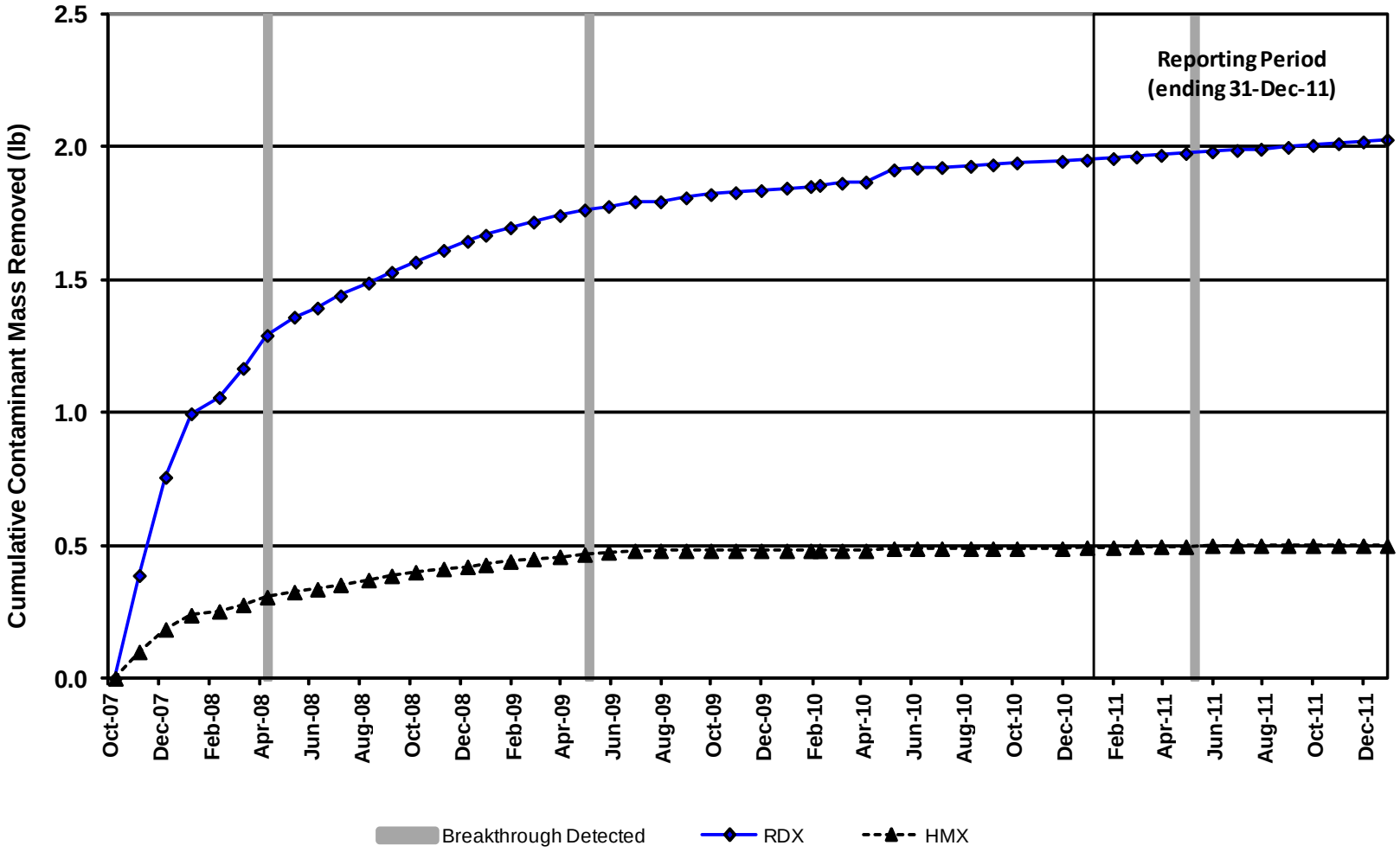
June 19, 2012 DWN: MTW CHKD: CJK

Impact Area Groundwater Study Program

FIGURE 3-2

Figure 3-3
Contaminant Mass Removal Since Start-up
J-1 Range Southern Groundwater Treatment System



US Army Corps of Engineers
New England District

TITLE
Contaminant Mass Removal J-1 Southern RRA ETI System

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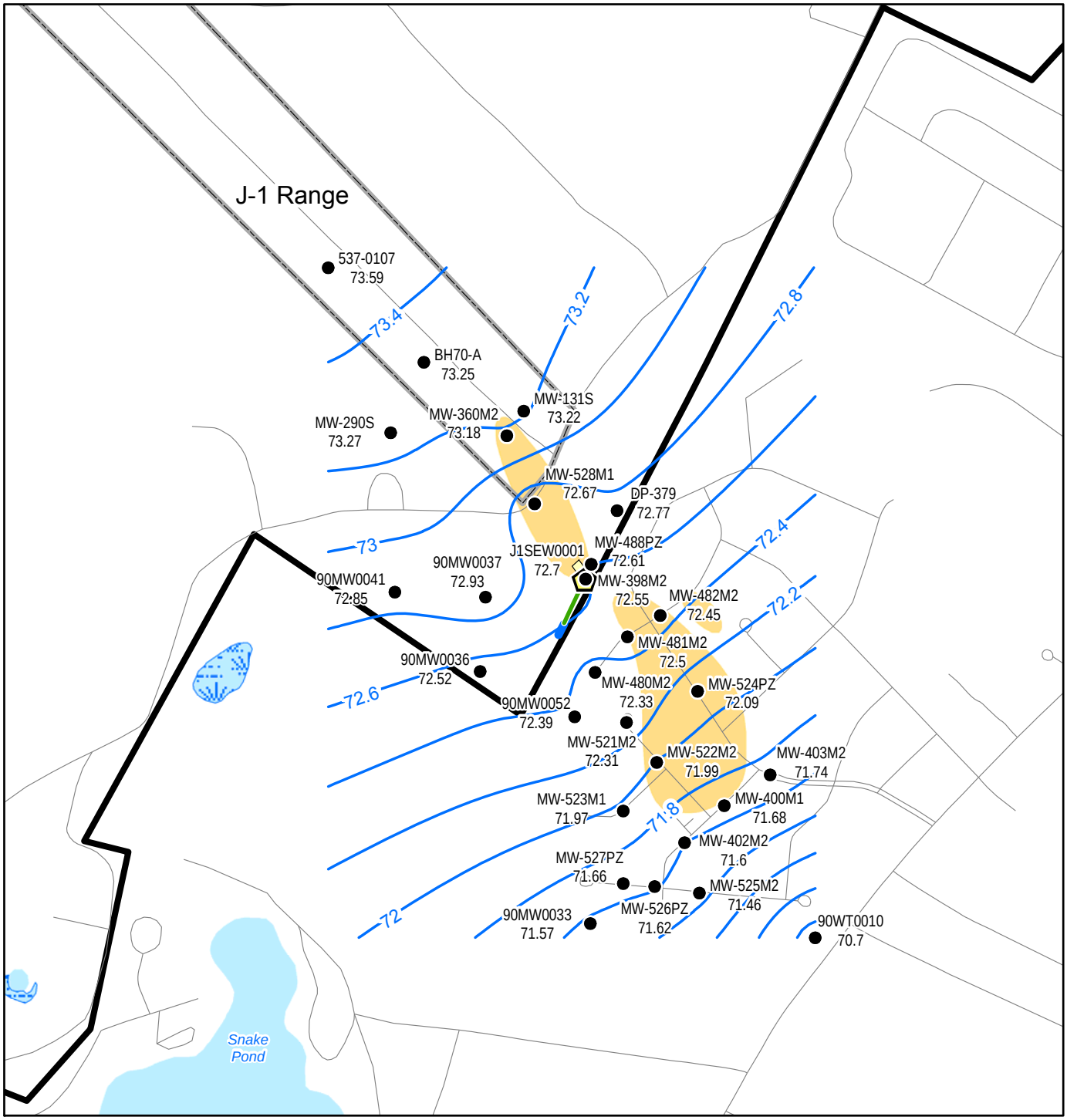
June 8, 2012 DWN: MTW CHKD: CJK

Impact Area Groundwater Study Program

FIGURE 3-3

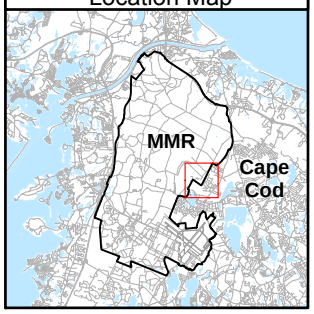


Legend

- Extraction Well
- Monitoring Well
- 72.6 — Potentiometric Contours, 0.2 foot mean sea level intervals
- RDX Plume (shown to 0.6 µg/L)
  Plume through November 2011

Note: Water levels from monitoring wells having mid-screen elevations between approximately 66 to -31 ft msl were used to contour data. Wells with mid-screen elevations outside this range were deemed less useful for this purpose.

Location Map



0 1,000 Feet

TITLE

J-1 Range Southern Groundwater Potentiometric Map for 24 October 2011

US Army Corps of Engineers
New England District

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FIGURE 4-1

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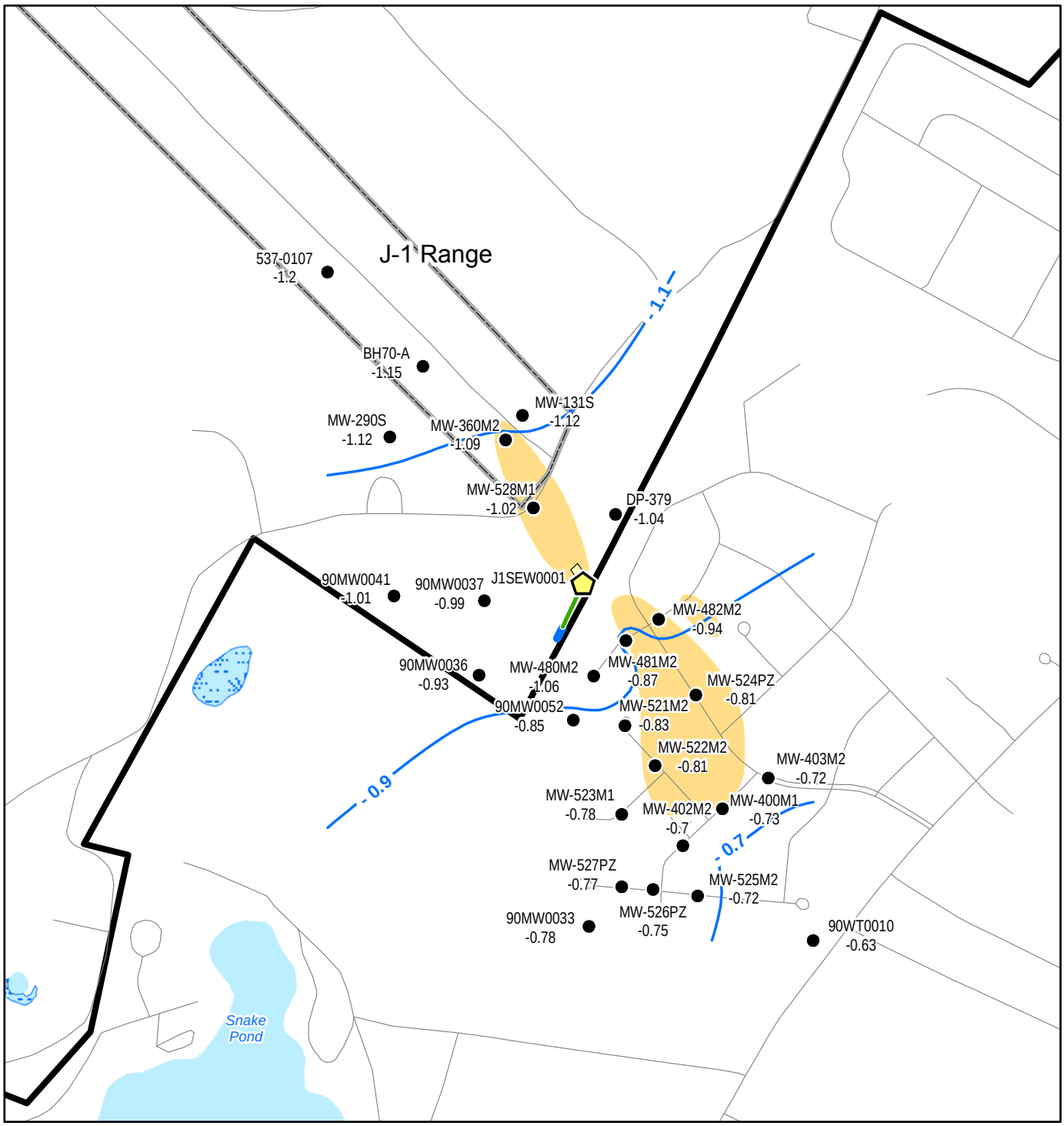
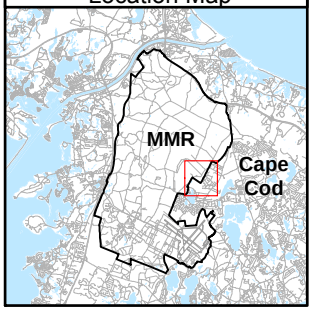


Legend

- Extraction Well
- Monitoring Well
- 0.9 — Water Level Changes, 0.2 foot intervals
- RDX Plume (shown to 0.6 µg/L)
  Plume through November 2011

Note: Water levels from monitoring wells having mid-screen elevations between approximately 66 to -31 ft msl were used to contour data. Wells with mid-screen elevations outside this range were deemed less useful for this purpose.

Location Map



N

0 1,000 Feet

TITLE

J-1 Range Southern
Groundwater Elevation Change
November 8, 2010
to October 24, 2011

US Army Corps of Engineers
New England District

Impact Area Groundwater Study Program

FIGURE 4-2

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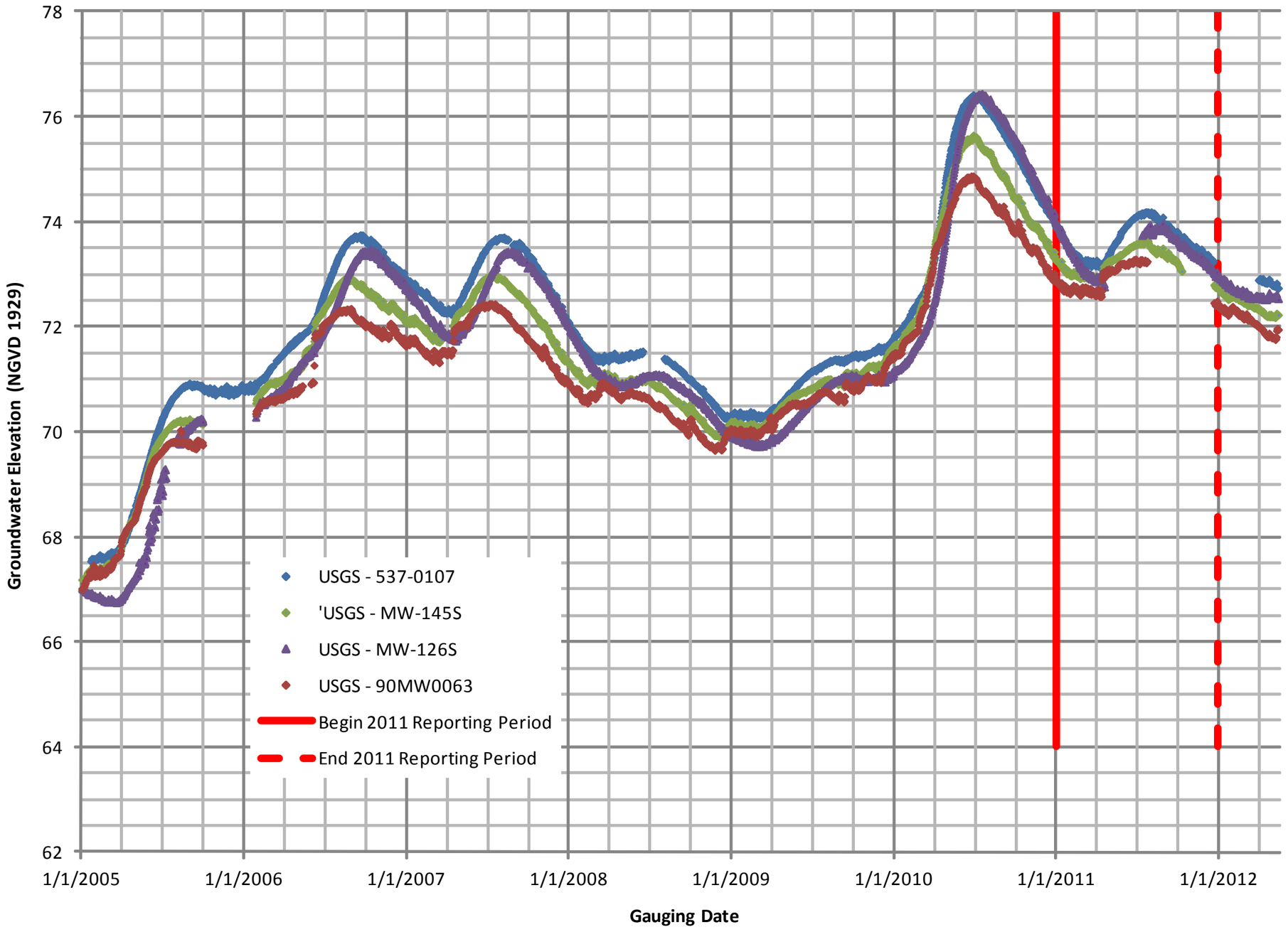
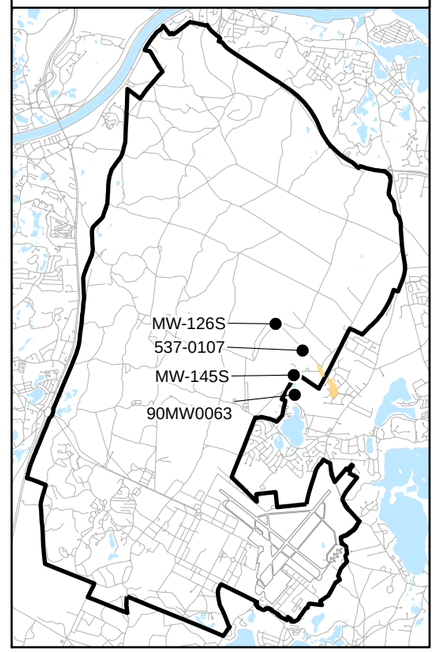
June 18, 2012 DWN: MTW CHKD: CJK

USGS Gauging Wells - Near Top of Mound



Impact Area Groundwater Study Program

LOCATION MAP



NOTES & SOURCES

Basemap data from US Geological Survey 7 1/2 minute Topographic Maps. Source: MassGIS

TITLE

USGS Background Monitoring Well Water Levels
January 2005 through December 2010

US Army Corps of Engineers
New England District

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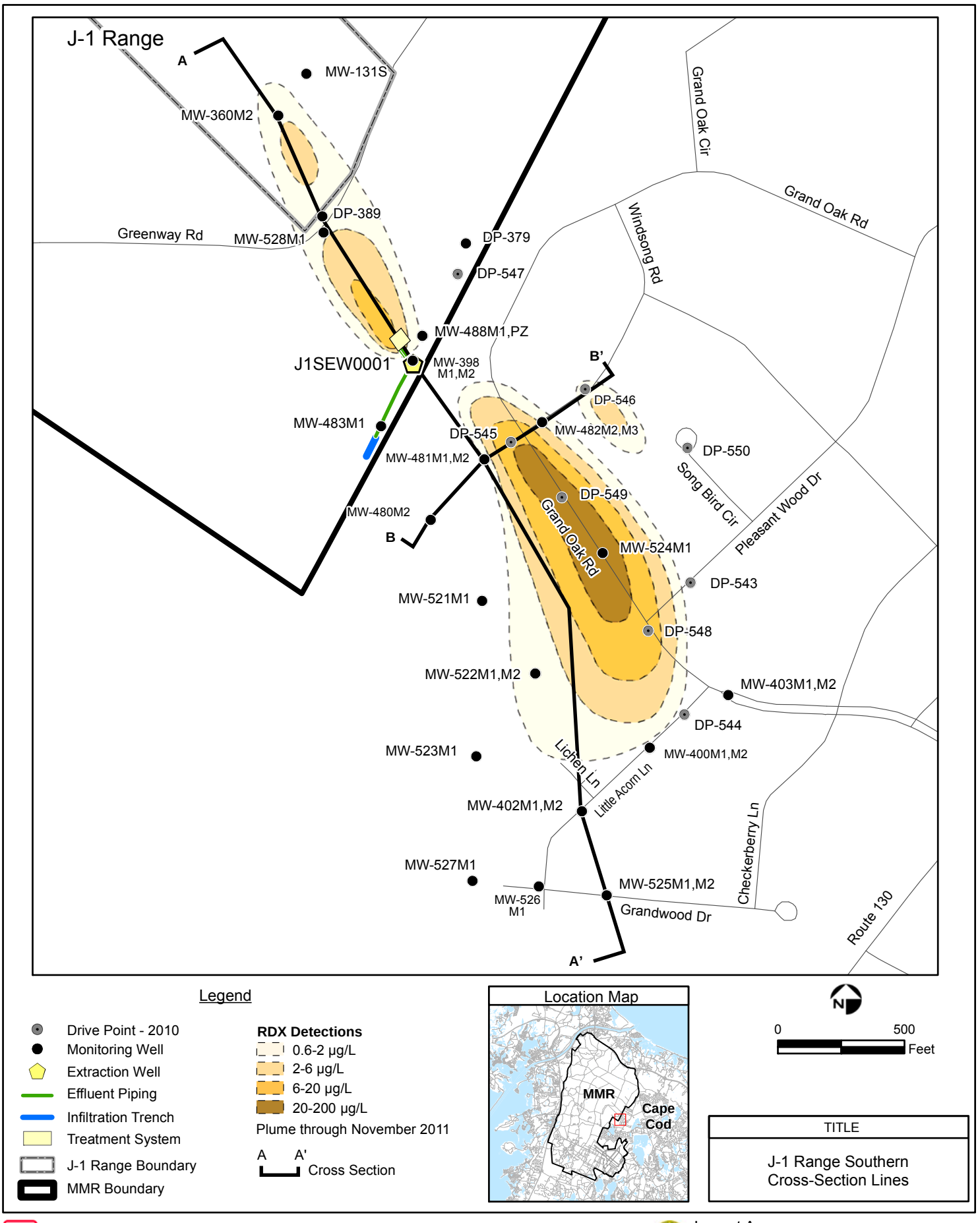
June 18, 2012 DWN: MTW CHKD: CJK

FIGURE
4-3



Legend

- Drive Point - 2010
- Monitoring Well
- Extraction Well
- Effluent Piping
- Infiltration Trench
- Treatment System
- J-1 Range Boundary
- MMR Boundary

RDX Detections

- 0.6-2 µg/L
- 2-6 µg/L
- 6-20 µg/L
- 20-200 µg/L

Plume through November 2011

A A' Cross Section

Location Map

N

0 500 Feet

TITLE

J-1 Range Southern
Cross-Section Lines

US Army Corps of Engineers
New England District

Impact Area Groundwater Study Program

FIGURE 5-1

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June 26, 2012 DWN: MTW CHKD: CJK

NORTHWEST

A

SOUTHEAST

A'

Separated for Clarity

Separated for Clarity

Separated for Clarity

MW-360 | MW-528 | DP-389 | MW-398 | J1SEW0001 | MW-481 Intersection with B-B' | DP-545 (projected) | DP-549 (projected) | MW-524M-1 (projected) | MW-522 (projected) | MW-402 | MW-525

Elevation (Feet Mean Sea Level, NGVD)

200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80 -90 -100 -110 -120 -130 -140 -150 -160 -170 -180 -190 -200 -210 -220

0.25 M2 | 2 | 0.6 | 0.41 M1 | 2 | 6 | ND M2 | M1 ND | ND M1 | NS M1

0.6 | ND M2 | 43 | 8.4 | 2.9 | 3.9 | 74 | 7.1 | 2.5 | 55.7 M1 | 20 | 6 | 2 | M2 1.4 | M1 ND | 0.6

ND M2 | ND M1 | ND M1 | ND M2 | ND M1

Legend

- Extraction Well
- Monitoring Well
- Water table
- M1 Well screen ID
- Extraction Well Screen
- Drive Point Location

- Sand
- Silt/ Clay
- Sand and Silt/Clay
- Basal Gravel/Sand
- Bedrock

NS	Not Sampled
J	Estimated Concentration
ND	Nondetect
µg/L	Micrograms per liter
NGVD	National Geodetic Vertical Datum

- 0.6-2 µg/L
- 2-6 µg/L
- 6-20 µg/L
- 20-200 µg/L

Drilling Profile Interval Data (µg/L)

Note: Unlabelled drilling profile intervals indicate nondetects during screening.

Data Sources: 27 April 2012, EDMS Database.
Drivepoint data from 2010

DRAFT

HORIZONTAL SCALE: 1"=300'
0' 150' 300'
0' 30' 60'
VERTICAL SCALE: 1"=60'

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT
CORPS OF ENGINEERS
CONCORD, MASSACHUSETTS

MASSACHUSETTS MILITARY RESERVATION
CAPE COD, MASSACHUSETTS
IMPACT AREA GROUNDWATER
STUDY PROGRAM
J-1 SITE
SOUTH PLUME CROSS SECTION A-A'
ILLUSTRATING RDX DISTRIBUTION IN
GROUNDWATER AS OF NOVEMBER 2011

DATE: 05/31/2012
PLOT SCALE: 1"=60'-0"
FILE NAME: J1_S-RDX_AA_Fig5-2_05-31-2012.DGN

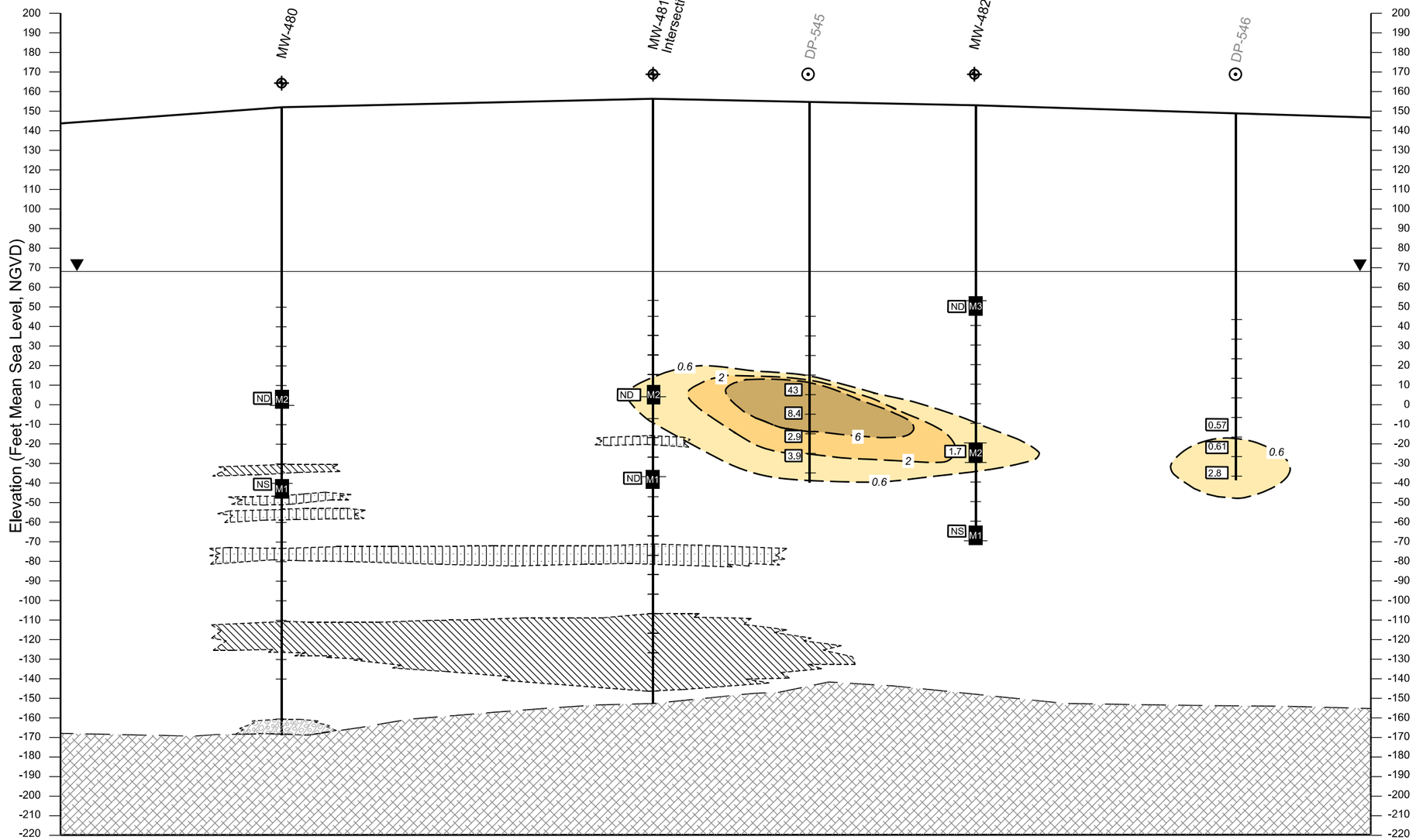
FIGURE 5-2

SOUTHWEST

B

NORTHEAST

B'



Legend

- Extraction Well
- Monitoring Well
- Water table
- M1 Well screen ID
- Extraction Well Screen
- Drive Point Location

- Sand
- Silt/ Clay
- Sand and Silt/Clay
- Basal Gravel/Sand
- Bedrock

NS	Not Sampled
J	Estimated Concentration
ND	Nondetect
µg/L	Micrograms per liter
NGVD	National Geodetic Vertical Datum

- 0.6-2 µg/L
- 2-6 µg/L
- 6-20 µg/L
- 20-200 µg/L

Drilling Profile Interval Data (µg/L)

Note: Unlabelled drilling profile intervals indicate nondetects during screening.

Data Sources: 27 April 2012, EDMS Database.
Drivepoint data from 2010

DRAFT

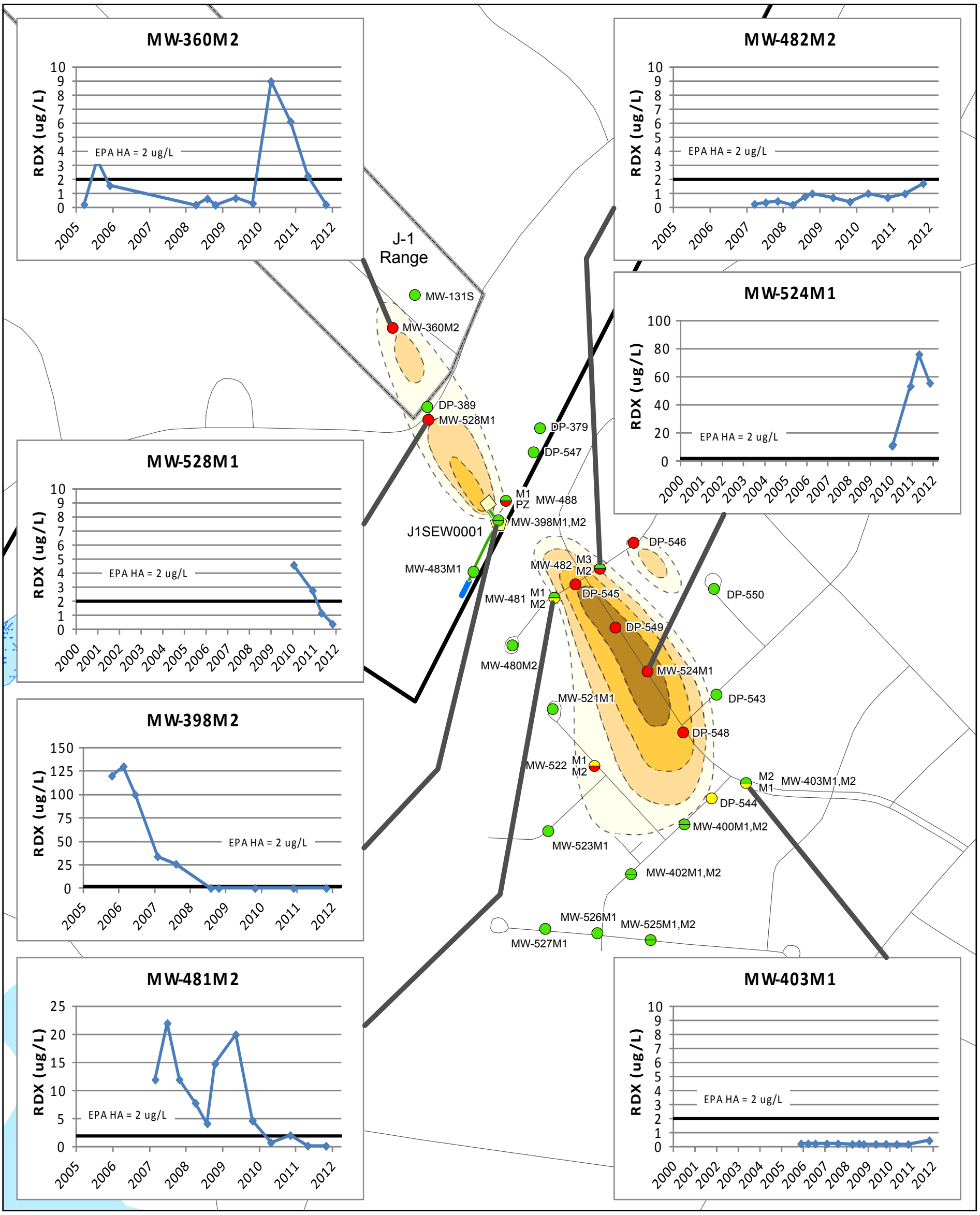
HORIZONTAL SCALE: 1"=100'
0' 50' 100'
0' 30' 60'
VERTICAL SCALE: 1"=60'

DEPARTMENT OF THE ARMY
NEW ENGLAND DISTRICT
CORPS OF ENGINEERS
CONCORD, MASSACHUSETTS

MASSACHUSETTS MILITARY RESERVATION
CAPE COD, MASSACHUSETTS
IMPACT AREA GROUNDWATER
STUDY PROGRAM
J-1 SITE
SOUTH PLUME CROSS SECTION B-B'
ILLUSTRATING RDX DISTRIBUTION IN
GROUNDWATER AS OF NOVEMBER 2011

DATE: 05/31/2012
PLOT SCALE: 1"=60'-0"
FILE NAME: J1_S-RDX_BB_Fig-5-3-05-31-2012.DGN

FIGURE 5-3



LEGEND

- Drive Point - 2010
- Extraction Well
- Effluent Piping
- Infiltration Trench
- Treatment System
- J-1 Range Boundary
- MMR Boundary

RDX Detections

- 0.6-2 µg/L
- 2-6 µg/L
- 6-20 µg/L
- 20-200 µg/L

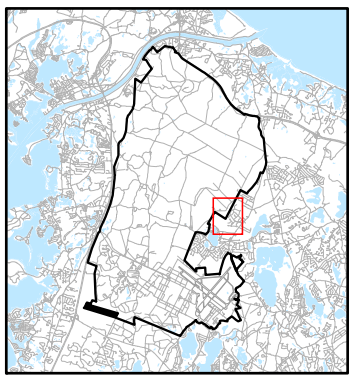
Plume through November 2011

RDX Detections in Groundwater

- No Detection
- Detection at or below 0.6 µg/L
- Detection above 0.6 µg/L
- Indicates different detections in different well screens
- RDX

Color coding for wells is based on highest values reported in 2011.
Color coding for drive points is based the highest value detected in the sequence of profile samples collected.

LOCATION MAP



N

0 500 Feet

NOTES & SOURCES
Base Data from US Geological Survey
7 1/2 minute Topgraphic Maps
Source: MassGIS

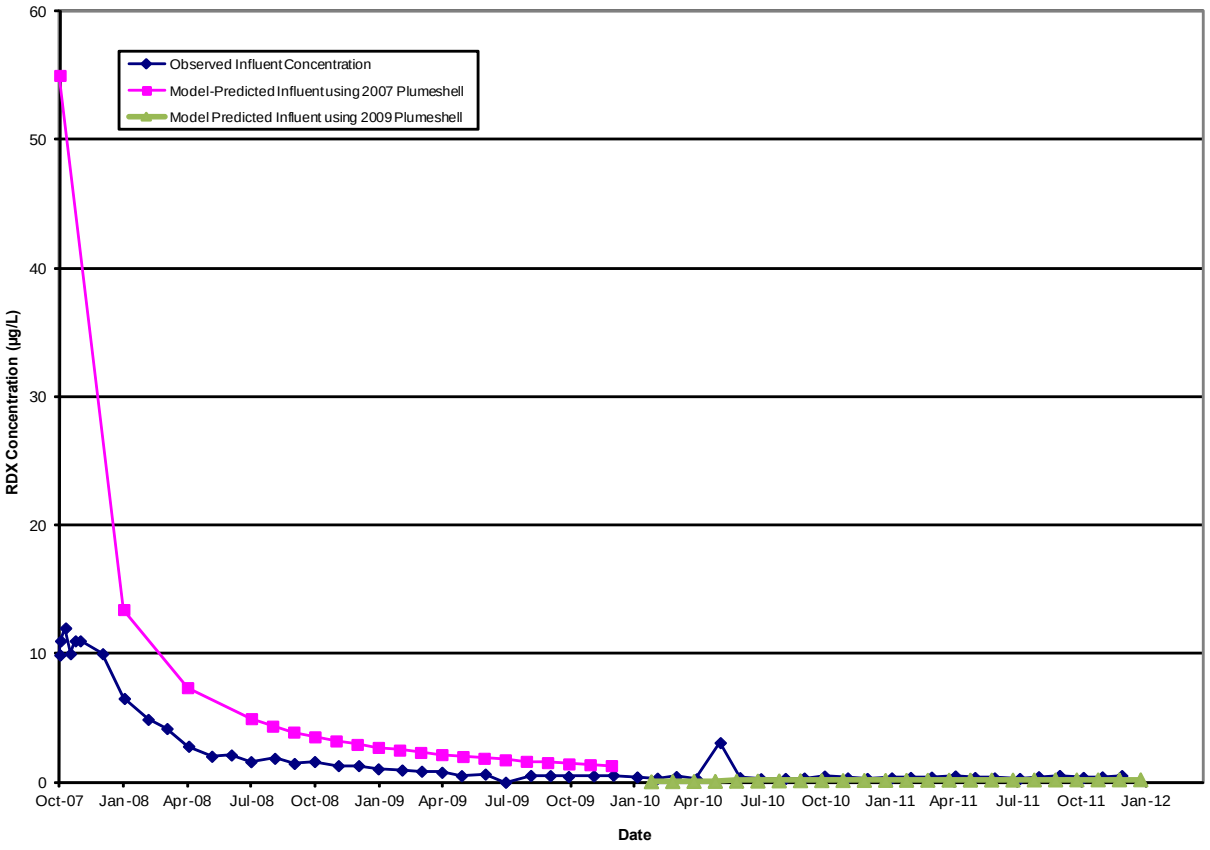
US Army Corps of Engineers
New England District

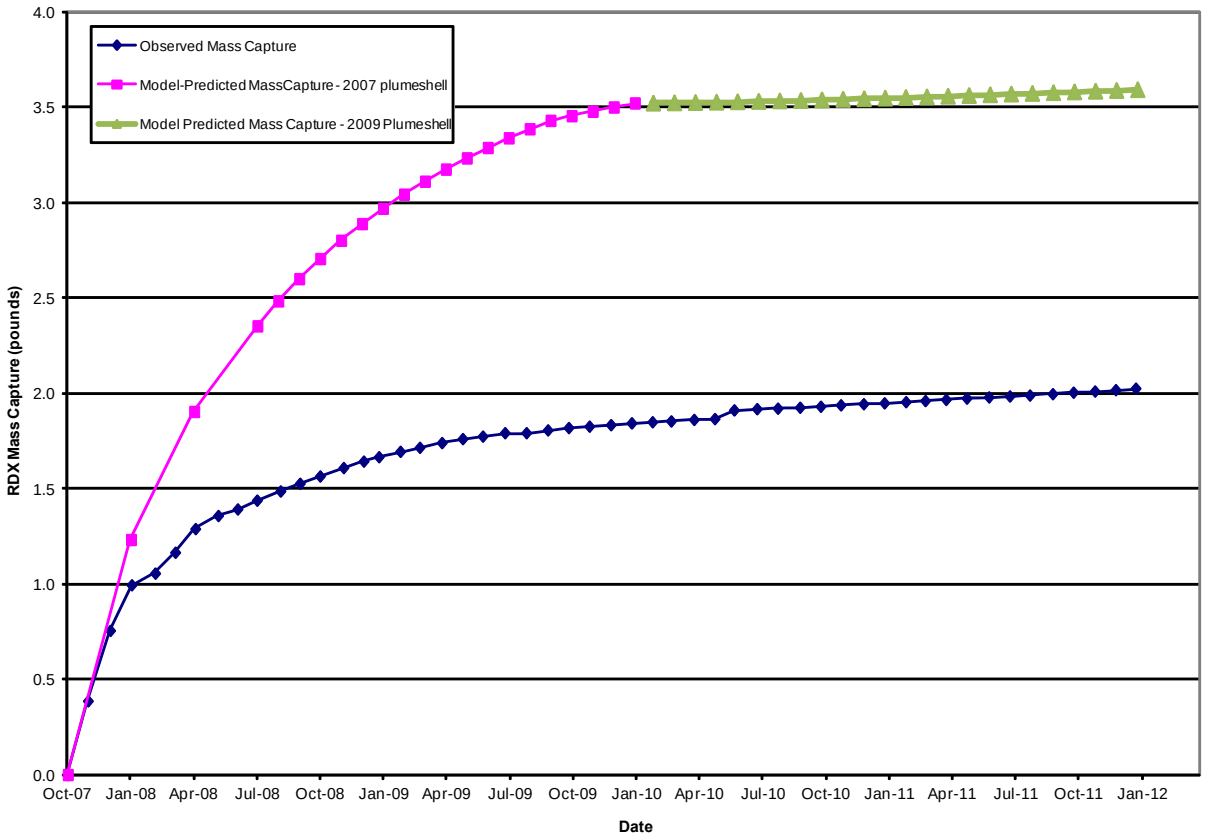
Impact Area Groundwater Study Program

J-1 Range Southern Trend-Plots for RDX

FIGURE 5-4

M:\MMR\2012\J-1S\AnnRpt\Figures\Fig5-4_082112.pdf
M:\MMR\2012\J-1S\AnnRpt\MXDs\Fig5-4_053112.mxd
August 21, 2012 DWN: MTW CHKD: CJK





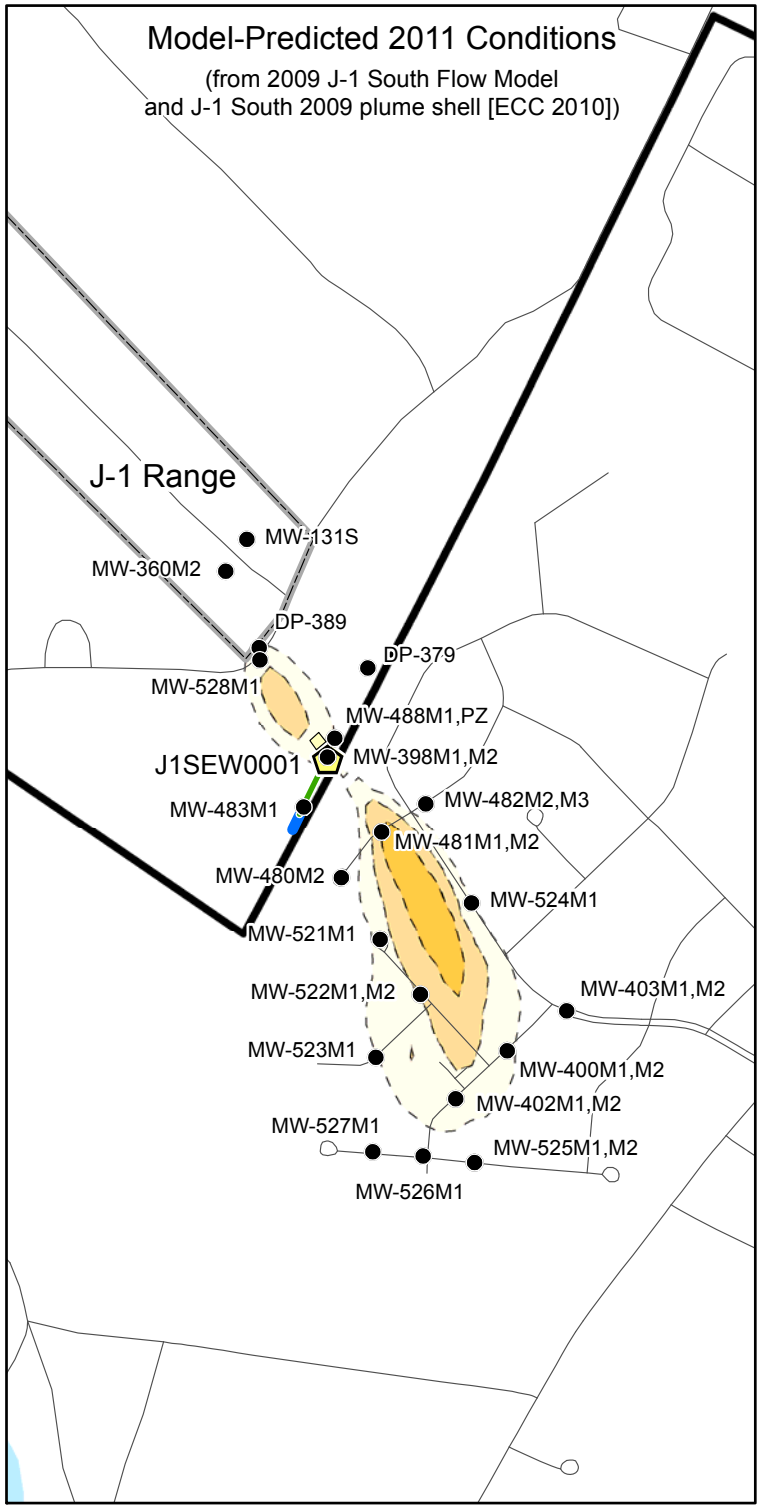
J-1 Range Southern Model-Predicted and Observed RDX Influent Concentrations and Mass Removal

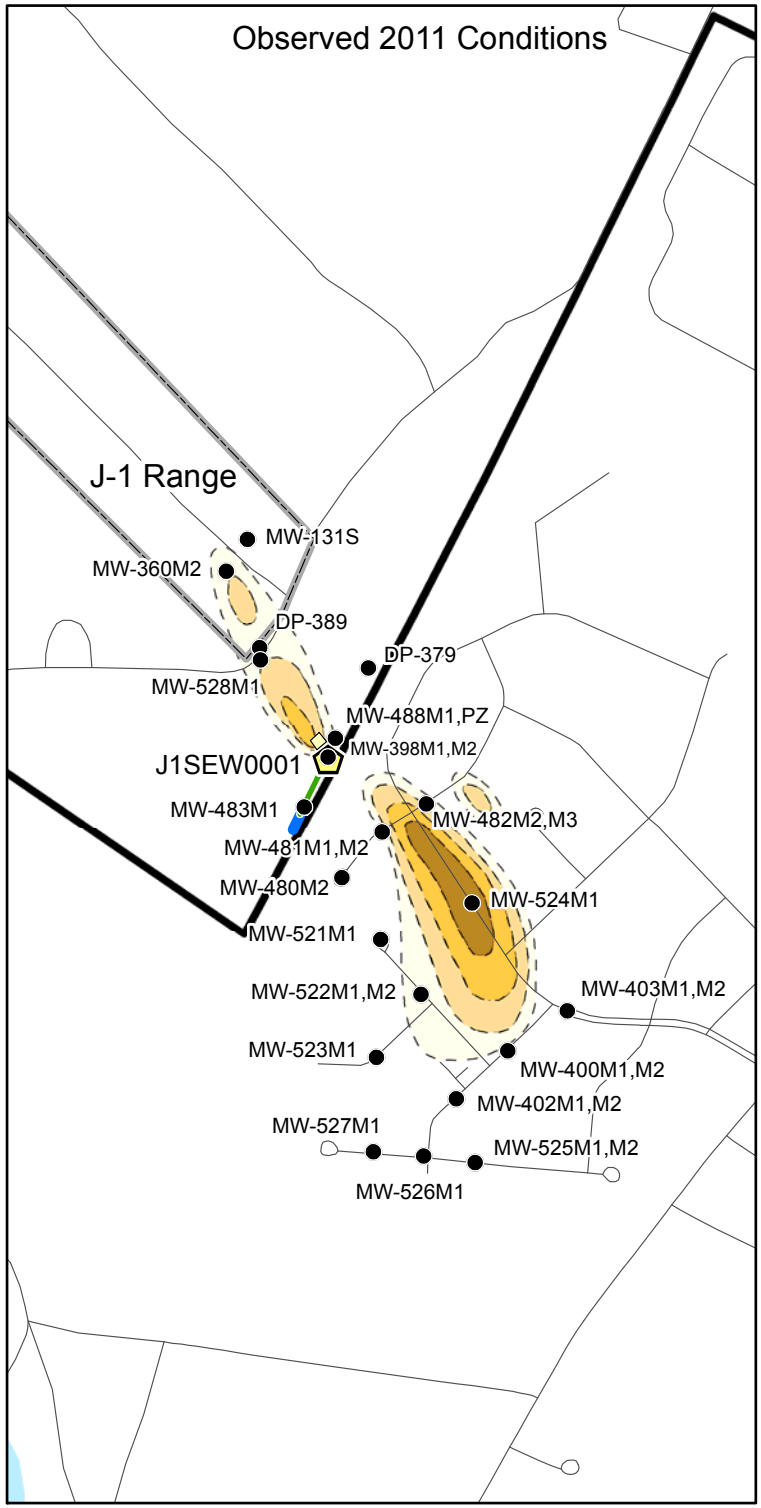
M:\MMR\2011\J-1South\Figures_Fig6-1_062612.pdf
M:\MMR\2011\J-1South\MXDs_Fig6-2_060512.mxd
June 26, 2012 DWN: MTW CHKD: CJK

US Army Corps of Engineers
New England District

Impact Area Groundwater Study Program

FIGURE 6-1





Impact Area Groundwater Study Program

LEGEND

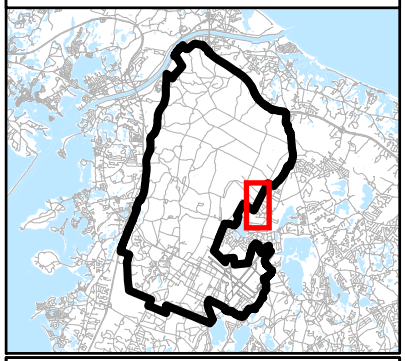
- Monitoring Well
- Extraction Well
- Effluent Piping
- Infiltration Trench
- Treatment System
- J-3 Range Boundary
- MMR Boundary

RDX Detections

- 0.6-2 µg/L
- 2-6 µg/L
- 6-20 µg/L
- 20-200 µg/L

Plumes through November 2011

LOCATION MAP



NOTES & SOURCES

Map Coordinate System: NAD83 UTM Zone 19N Meters
Basemap data from US Geological Survey 7 1/2 minute
Topographic Maps: Source: MassGIS

TITLE

J-1 Range Southern
Model-Predicted (2009 Plume Shell)
and Observed RDX Distribution

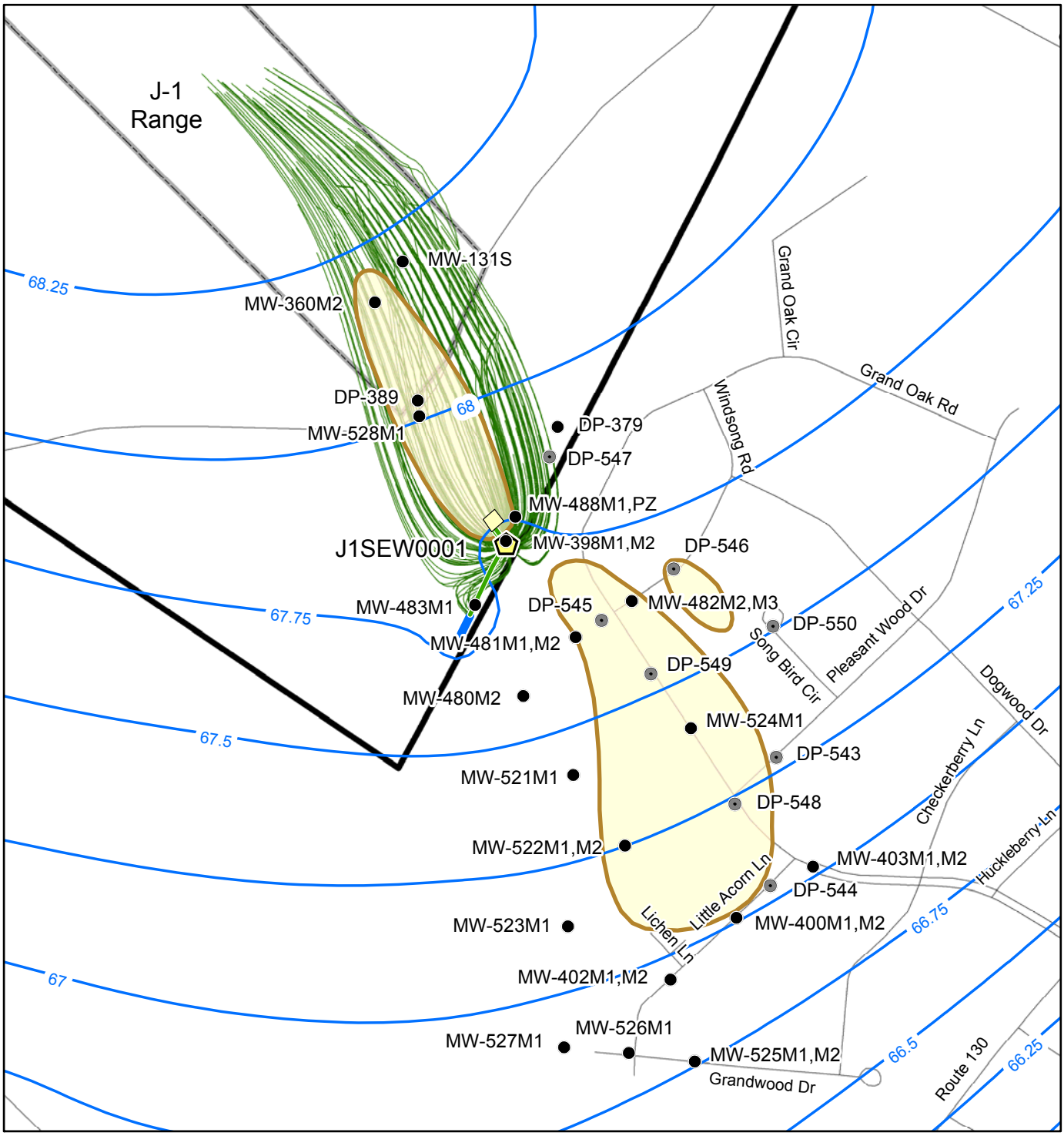
0 1,000 Feet

N

US Army Corps of Engineers
New England District

FIGURE 6-2

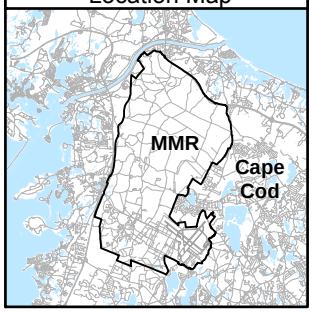
M:\MMR\2012\J-1S\AnnRpt\Figures\Fig6-2_062612.pdf
M:\MMR\2012\J-1S\AnnRpt\MXDs\Fig6-2_051612.mxd
June 26, 2012 DWN: MTW CHKD: CJK



Legend

- Drive Point - 2010
- Monitoring Well
- Extraction Well
- J-1 Range Boundary
- MMR Boundary
- RDX Plume (shown to 0.6 µg/L)
- Reverse particle tracks originating from J1SEW0001
- 67.5 — Potentiometric Contours (Operational Conditions), 0.25 foot mean sea level intervals (Base Scenario)

Location Map



N

0 600 Feet

TITLE

Model-Predicted Capture Zones for J-1 Range Southern Groundwater

US Army Corps of Engineers
New England District

Impact Area Groundwater Study Program

FIGURE 6-3

M:\MMR\2012\J-1S\AnnRpt\Figures\Fig6-3_060712.pdf
M:\MMR\2012\J-1S\AnnRpt\MXDs\Fig6-3_053112.mxd
June 7, 2012 DWN: MTW CHKD: CJK

TABLES

Table 1-1
J-1 Range Southern Groundwater Chemical Monitoring Network- 2011

Well ID	Northing (UTM 83 m)	Easting (UTM 83 m)	Surface Elevation (ft msl)	Top of Screen Elevation (ft msl)	Bottom of Screen Elevation (ft msl)	Rationale for Location	2011 Sampling Frequency	Parameters *
DP-379	4617054	374279	164.38	-28.98	-33.98	Monitor the northeastern boundary of the J-1 S plume	A	Explosives
DP-389	4617086	374106	157	-7.26	-12.26	Monitor the lower boundary of the J-1 S plume	A	Explosives
J1SEW0001	4616909	374216	160	42	2	Extraction well for J-1 S ETI System, used to help calculate and confirm mass removal by the system	M	Explosives
MW-131S	4617258	374088	167.3	71.3	61.3	Potential source area well and northern boundary well to monitor explosives	A	Explosives
MW-360M2	4617208	374053	165.11	63.11	53.11	Monitor the source area and trailing edge of the J-1 S plume	S	Explosives
MW-398M1	4616913	374215	161.43	-10.72	-20.72	Monitor groundwater below core of J-1 S plume	A	Explosives
MW-398M2	4616913	374215	161.43	29.9	19.9	Monitor core of J-1 S plume	A	Explosives
MW-400M1	4616446	374501	136.98	-55.78	-65.78	Monitor downgradient of the leading edge of the J-1 S plume	A	Explosives
MW-400M2	4616446	374501	136.98	-1.92	-11.92	Monitor downgradient of the leading edge of the J-1 S plume	A	Explosives
MW-402M1	4616370	374419	140.89	-49.25	-59.25	Monitor downgradient of the leading edge of the J-1 S plume	A	Explosives
MW-402M2	4616370	374419	140.89	-14.35	-24.35	Monitor downgradient of the leading edge of the J-1 S plume	S	Explosives
MW-403M1	4616510	374595	147.72	-12.18	-22.18	Monitor downgradient of the leading edge of the J-1 S plume	A	Explosives
MW-403M2	4616510	374595	147.72	20.46	10.46	Monitor downgradient of the leading edge of the J-1 S plume	S	Explosives
MW-480M2	4616721	374237	152	9.56	-0.44	Monitor the southwestern boundary of the J-1 S plume	A	Explosives
MW-481M1	4616794	374301	156.16	-33.58	-43.58	Monitor the core of the J-1 S plume	A	Explosives
MW-481M2	4616794	374301	156.16	9.88	-0.12	Monitor the core of the J-1 S plume	S	Explosives
MW-482M2	4616838	374371	153	-16.63	-26.63	Monitor the northeastern boundary of the J-1 S plume	S	Explosives
MW-482M3	4616838	374371	153	58.08	48.08	Monitor the northeastern boundary of the J-1 S plume	A	Explosives
MW-483M1	4616833	374177	165	22.61	12.61	Monitor the southeastern boundary of the J-1 S plume	A	Explosives

Table 1-1
J-1 Range Southern Groundwater Chemical Monitoring Network- 2011

Well ID	Northing (UTM 83 m)	Easting (UTM 83 m)	Surface Elevation (ft msl)	Top of Screen Elevation (ft msl)	Bottom of Screen Elevation (ft msl)	Rationale for Location	2011 Sampling Frequency	Parameters *
MW-488M1	4616942	374227	160	12.8	2.8	Monitor the core of the J-1 S plume	A	Explosives
MW-488PZ	4616942	374227	160	43.14	33.14	Monitor the upper boundary of the J-1 S plume	A	Explosives
MW-521M1	4616623	374299	136.26	-21.74	-31.74	Monitor the northwestern edge of the plume south of base boundary	A	Explosives
MW-522M1	4616536	374363	151.74	-46.26	-56.26	Monitor near core of plume	S	Explosives
MW-522M2	4616536	374363	151.74	-13.26	-23.26	Monitor near core of plume	S	Explosives
MW-523M1	4616436	374292	148.17	-9.83	-19.83	Monitor the southwestern boundary of the plume	A	Explosives
MW-524M1	4616681	374444	154.32	6.32	-3.68	Monitor near core of plume	S	Explosives
MW-525M1	4616269	374449	152.39	-19.61	-29.61	Monitor the leading edge of the plume	S	Explosives
MW-525M2	4616269	374449	152.39	4.39	-5.61	Monitor the leading edge of the plume	S	Explosives
MW-526M1	4616279	374367	152.72	-11.28	-21.28	Monitor the leading edge of the plume	S	Explosives
MW-527M1	4616286	374287	151.62	-13.38	-23.38	Monitor the leading edge of the plume	S	Explosives
MW-528M1	4617067	374108	156.68	39.68	29.68	Monitor downgradient of source area along plume core	S	Explosives

Notes:

J-1 = J-1 Range
J-1 S = J-1 Range Southern
ft msl = feet mean sea level
m = meters
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine
HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
SVOC = semi-volatile organic compound
VOC = volatile organic compound
UTM 83 m = Universal Transverse Mercator North American Datum 1983 meters

(a)
A = annually
S = semiannually
M = monthly
(b)
Explosives = EPA Method SW846/8330
Perchlorate = EPA Method E314.0 or SW6850
SVOCs = EPA Method 8270C
VOCs = EPA Method SW8260B

Table 1-2
J-1 Range Southern Hydraulic Monitoring Network- 2011

Well	Easting Coordinate on Surface (N83 UTM m)	Northing Coordinate on Surface (N83 UTM m)	Surface Elevation (ft msl)	MP Elev (ft msl)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)	Mid Screen Elevation (ft msl)
90MW0033	374225	4616203	152.10	154.34	-2.63	-7.63	5	-5.13
90MW0036	373998	4616722	124.00	126.31	19.35	14.35	5	16.85
90MW0037	374009	4616876	157.10	156.42	47.21	42.21	5	44.71
90MW0041	373823	4616886	159.60	161.63	34.23	29.23	5	31.73
90MW0052	374193	4616629	129.80	132.50	34.87	29.87	5	32.37
90WT0010	374688	4616174	152.40	151.97	69.05	59.05	10	64.05
BH70-A	373882	4617359	164.88	165.79	59.38	49.38	10	54.38
DP-379	374279	4617054	160.42	162.46	-28.98	-33.98	5	-31.48
J1SEW0001	374216	4616909	N/A	161.35	44	4	40	24
MW-131M2	374087	4617258	167.30	167.02	-27.70	-37.70	10	-32.70
MW-131S	374087	4617258	167.30	167.00	71.30	61.30	10	66.30
MW-290M3	373814	4617213	164.50	163.73	20.03	10.03	10	15.03
MW-290S	373814	4617214	164.30	164.04	64.20	54.20	10	59.20
MW-360M1	374053	4617208	165.11	164.41	-81.89	-91.89	10	-86.89
MW-360M2	374053	4617208	165.11	164.37	63.11	53.11	10	58.11
MW-398M1	374215	4616913	161.43	161.09	-10.72	-20.72	10	-15.72
MW-398M2	374215	4616913	161.43	161.11	29.90	19.90	10	24.90
MW-400M1	374501	4616446	136.98	136.7	-55.78	-65.78	10	-60.78
MW-400M2	374501	4616446	136.98	136.69	-1.92	-11.92	10	-6.92
MW-400PZ	374501	4616446	136.98	136.43	72.32	62.32	10	67.32
MW-402M1	374419	4616370	140.89	140.25	-49.25	-59.25	10	-54.25
MW-402M2	374419	4616370	140.89	140.26	-14.35	-24.35	10	-19.35
MW-402PZ	374419	4616370	140.89	140.02	71.16	61.16	10	66.16
MW-403M1	374595	4616510	147.72	147.09	-12.18	-22.18	10	-17.18
MW-403M2	374595	4616510	147.72	147.09	20.46	10.46	10	15.46
MW-480M2	374237	4616721	153.13	152.77	9.56	-0.44	10	4.56
MW-481M1	374301	4616794	156.16	155.65	-33.58	-43.58	10	-38.58
MW-481M2	374301	4616794	156.16	155.66	9.88	-0.12	10	4.88
MW-482M2	374371	4616838	156.01	155.46	-16.63	-26.63	10	-21.63

Table 1-2
J-1 Range Southern Hydraulic Monitoring Network- 2011

Well	Easting Coordinate on Surface (N83 UTM m)	Northing Coordinate on Surface (N83 UTM m)	Surface Elevation (ft msl)	MP Elev (ft msl)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)	Mid Screen Elevation (ft msl)
MW-482M3	374371	4616838	156.26	155.78	58.08	48.08	10	53.08
MW-483M1	374177	4616833	162.13	162.54	22.61	12.61	10	17.61
MW-483PZ	374177	4616834	165.00	162.25	56.71	46.71	10	51.71
MW-488M1	374227	4616942	162.42	162.51	12.8	2.8	10	7.80
MW-488PZ	374227	4616942	162.42	162.51	43.14	33.14	10	38.14
MW-521M1	374299	4616623	136.26	136.13	-21.74	-31.74	10	-26.74
MW-521M2	374299	4616623	136.26	136.09	34.26	24.26	10	29.26
MW-522M1	374363	4616536	151.74	151.43	-46.26	-56.26	10	-51.26
MW-522M2	374363	4616536	151.74	151.42	-13.26	-23.26	10	-18.26
MW-522PZ	373363	4616536	151.74	151.37	33.74	23.74	10	28.74
MW-523M1	374292	4616436	148.17	147.87	-9.83	-19.83	10	-14.83
MW-523PZ	374292	4616436	148.17	147.89	34.17	24.17	10	29.17
MW-524M1	374444	4616681	154.32	154.03	6.32	-3.68	10	1.32
MW-524PZ	374444	4616681	154.32	154.03	35.32	25.32	10	30.32
MW-525M1	374449	4616269	152.39	152.05	-19.61	-29.61	10	-24.61
MW-525M2	374449	4616269	152.39	152.07	4.39	-5.61	10	-0.61
MW-526M1	374367	4616279	152.72	152.44	-11.28	-21.28	10	-16.28
MW-526PZ	374367	4616279	152.72	152.46	35.72	25.72	10	30.72
MW-527M1	374287	4616286	151.62	151.32	-13.38	-23.38	10	-18.38
MW-527PZ	374287	4616286	151.62	151.32	33.62	23.62	10	28.62
MW-528M1	374108	4617067	156.68	156.42	39.68	29.68	10	34.68

ft msl = feet mean sea level
N83UTM m = North American Datum of 1983 Universal Transverse Mercator coordinates in meters

Table 2-1
J-1 Range Southern Groundwater Treatment System
Plant Maintenance, Availability, and Downtime Summary

Period	Availability		Maintenance/Downtime for Period		
	Period	Start-up to Date	Pump Hours	Event	Date/Action
Jan-11	100%	96.86%	0	No Downtime	No Downtime
Feb-11	100%	96.94%	0	No Downtime	No Downtime
Mar-11	100%	97.01%	0	No Downtime	No Downtime
Apr-11	90.50%	96.86%	68.4	1. System power outage due to accident on Rt 130 2. Power failure	1. System shutdown at 1608 h on 22 April; restarted at 0908 h on 25 April 2. System down at 0554 h on 28 April and restarted at 0918 h on 28 April
May-11	100%	96.93%	0	No Downtime	No Downtime
Jun-11	94.04%	96.87%	42.92	System shutdown to exchange granular activated carbon	System shutdown at 1439 h on 13 June and was restarted at 0934 h on 15 June
Jul-11	99.84%	96.93%	1.13	System shutdown due to power failure	System shutdown at 1246 h on 13 July and restarted at 1354 h on 23 July
Aug-11	94.32%	96.87%	45.02	The system was shut down to prepare for Hurricane Irene	System shutdown at 1231 h on 27 August and was restarted at 0932 h on 29 August
Sep-11	82.83%	96.58%	123.63	1. System power outage due to ground pump faut 2. Power failure due to down power line 3. Power failure due to down power line	1. System shutdown at 0143 h on 05 Sept; restarted at 1039 h on 06 Sept 2. System down at 1819 h on 08 Sept and restarted at 0837 h on 12 Sept 3. System down at 0009 h 24 Sept; restarted 0433 h on 24 Sept
Oct-11	99.67%	96.64%	2.48	System shutdown due to power failure (no alarm)	System shutdown at 1343 h on 20 October and restarted at 1612 h on 20 October
Nov-11	100%	96.71%	0	No Downtime	No Downtime
Dec-11	100%	96.77%	0	No Downtime	No Downtime
Totals through 31 December 2011	96.76%	96.77%	160.17	Total Downtime: Planned Shutdowns	
			1012.93	Total Downtime: Unplanned Shutdowns	
			1173.3	Total Downtime Hours since Startup	

Table 3-1
J-1 Southern RRA System Sampling Locations
and Parameters for Operational Monitoring
Environmental and System Performance Monitoring

Parameter	System Influent	J1 MID-1 Following Lead GAC	J1 MID-2 Following Lag GAC	System Effluent
Contaminants of Concern				
Explosives	monthly	Monthly	None, then monthly with MID-1 Detection	monthly
Geochemistry				
Metals, Modified; Hardness	TBD	TBD	TBD	TBD
Chloride; Sulfate; Alkalinity	TBD	TBD	TBD	TBD
Ammonia; Nitrate/Nitrite; Phosphorus	TBD	TBD	TBD	TBD
Total Organic Carbon	TBD	TBD	TBD	TBD
Total Suspended Solids (TSS)	TBD	TBD	TBD	TBD
Field Measurements				
Dissolved Oxygen	X	X	X	X
pH	X	X	X	X
Specific Conductivity	X	X	X	X
Temperature	X	X	X	X
Oxygen Reduction Potential	X	X	X	X
Turbidity	X	X	X	X

Notes:

1. X = Field measurements will be taken concurrent with all sampling events
2. TBD = To be determined in order to evaluate system operations. As an example, should rapid or multiple breakthrough of the GAC vessels occur, an investigation will take place which may include analyzing additional geochemistry parameters in influent and effluent to determine if the treatment system is affected by the groundwater quality.
3. Sampling locations, parameters and frequency will be continuously evaluated and any proposed changes will be submitted for review and approval prior to implementation

Table 3-2
J-1 Range Southern Groundwater Treatment System
Analytical Results for January 2011 through December 2011

Date	Time	Location Identifier	Sample Port	Laboratory Analyses		Field Parameters					
				Explosives							
				RDX (µg/L)	HMX (µg/L)	Temp (°C)	SpC (µS/cm)	DO (mg/L)	pH	ORP (mV)	Turb. (ntu)
1/10/2011	14:55	J1S-INF	J1S-INF-38A	0.336	ND	9.83	76	11.66	5.86	182.9	0.00
1/10/2011		J1S-MID	J1SMID-38A	NS	NS	-	-	-	-	-	-
1/10/2011	15:00	J1S-MID-2	J1SMID-2-38A	ND	ND	9.96	71	10.51	5.69	190.7	0.00
1/10/2011	15:05	J1S-EFF	J1S-EFF-38A	ND	ND	9.90	71	10.17	5.62	209.9	0.00
2/6/2011	11:35	J1S-INF	J1S-INF-39A	0.377	ND	9.69	74	11.68	5.89	183.2	0.00
2/6/2011		J1S-MID	J1SMID-39A	NS	NS	-	-	-	-	-	-
2/6/2011	11:40	J1S-MID-2	J1SMID-2-39A	ND	ND	9.84	74	10.5	5.85	176.6	0.00
2/6/2011	11:45	J1S-EFF	J1S-EFF-39A	ND	ND	9.89	73	9.82	5.74	202.8	0.00
3/8/2011	12:25	J1S-INF	J1S-INF-40A	0.393	ND	9.62	73	11.7	6.33	192.3	0.00
3/8/2011		J1S-MID	J1SMID-40A	NS	NS	-	-	-	-	-	-
3/8/2011	12:30	J1S-MID-2	J1SMID-2-40A	ND	ND	9.89	72	11.38	6.3	187.4	0.00
3/8/2011	12:35	J1S-EFF	J1S-EFF-40A	ND	ND	9.88	75	11.15	6.13	199.6	0.00
4/11/2011	13:05	J1S-INF	J1S-INF-41A	0.481	ND	10.09	81	11.98	6.09	214.8	0.00
4/11/2011		J1S-MID	J1SMID-41A	NS	NS	-	-	-	-	-	-
4/11/2011	13:10	J1S-MID-2	J1SMID-2-41A	ND	ND	10.04	81	10.92	6	218.5	0.00
4/11/2011	13:15	J1S-EFF	J1S-EFF-41A	ND	ND	10.08	81	9.57	5.85	229.6	0.00
5/9/2011	14:05	J1S-INF	J1S-INF-42A	0.371	ND	10.55	85	11.11	6.19	202.1	0.00
5/9/2011		J1S-MID	J1SMID-42A	NS	NS	-	-	-	-	-	-
5/9/2011	14:10	J1S-MID-2	J1SMID-2-42A	**0.256**	ND	10.35	84	10.36	10.35	217.3	0.00
5/9/2011	14:15	J1S-EFF	J1S-EFF-42A	ND	ND	10.37	82	9.53	10.37	234	0.00
6/6/2011	14:00	J1S-INF	J1S-INF-43A	0.332	ND	11.04	84	11.21	6.15	194	0.00
6/6/2011		J1S-MID	J1SMID-43A	NS	NS	-	-	-	-	-	-
6/6/2011	14:05	J1S-MID-2	J1SMID-2-43A	ND	ND	10.74	83	10.16	5.92	208.2	0.00
6/6/2011	14:10	J1S-EFF	J1S-EFF-43A	ND	ND	10.80	83	9.42	5.86	227	0.00
7/12/2011	15:00	J1S-INF	J1S-INF-44A	0.292	ND	10.96	87	12.78	6.15	154.7	0.00
7/12/2011	15:05	J1S-MID	J1SMID-44A	ND	ND	10.59	88	10.82	6.01	159.1	0.00
7/12/2011		J1S-MID-2	J1SMID-2-44A	NS	NS	-	-	-	-	-	-
7/12/2011	15:10	J1S-EFF	J1S-EFF-44A	ND	ND	10.69	87	10.04	5.87	171	0.00
8/8/2011	9:10	J1S-INF	J1S-INF-45A	0.430	ND	10.55	87	11.15	6.6	207	0.00
8/8/2011	9:15	J1S-MID	J1SMID-45A	ND	ND	10.31	86	10.61	6.04	208.2	0.00
8/8/2011		J1S-MID-2	J1SMID-2-45A	NS	NS						
8/8/2011	9:20	J1S-EFF	J1S-EFF-45A	ND	ND	10.37	86	10.23	5.87	210.8	0.00
9/7/2011	15:00	J1S-INF	J1S-INF-46A	0.524	ND	10.53	91	12.38	6.15	154.2	0.00
9/7/2011	15:05	J1S-MID	J1SMID-46A	ND	ND	10.13	91	12.05	6.06	160.1	0.00
9/7/2011		J1S-MID-2	J1SMID-2-46A	NS	NS						
9/7/2011	15:20	J1S-EFF	J1S-EFF-46A	ND	ND	10.22	91	11.77	6.05	165.4	0.00
10/11/2011	14:50	J1S-INF	J1S-INF-47A	0.375	ND	10.47	85	11.31	6.19	132.7	0.00
10/11/2011	14:55	J1S-MID	J1SMID-47A	ND	ND	10.17	85	10.94	6.12	143.1	0.00
10/11/2011		J1S-MID-2	J1SMID-2-47A	NS	NS						
10/11/2011	15:00	J1S-EFF	J1S-EFF-47A	ND	ND	10.16	85	10.48	5.99	152.9	0.00
11/7/2011	15:25	J1S-INF	J1S-INF-48A	0.417	ND	10.24	85	11.39	6.12	93.8	0.00
11/7/2011	15;30	J1S-MID	J1SMID-48A	ND	ND	10.04	84	10.77	6.13	102.8	0.00
11/7/2011		J1S-MID-2	J1SMID-2-48A	NS	NS						
11/7/2011	15:35	J1S-EFF	J1S-EFF-48A	ND	ND	10.12	84	9.99	6.02	113.9	0.00
12/5/2011	14:45	J1S-INF	J1S-INF-49A	0.518	ND	10.18	88	10.18	6.22	149.4	0.00
12/5/2011	14:50	J1S-MID	J1SMID-49A	ND	ND	10.04	84	10.04	6.12	152.1	0.00
12/5/2011		J1S-MID-2	J1SMID-2-49A	NS	NS						
12/5/2011	14:55	J1S-EFF	J1S-EFF-49A	ND	ND	10.06	84	10.06	5.96	165.3	0.00

LEGEND

RDX = Hexa Hexahydro-1,3,5-Trinitro-1,3,5-Triazine
HMX = Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine

NS = not sampled
ND = RDX and HMX not detected above 0.25 µg/L
J = estimated value

J1S-INF System Influent
J1S-MID GAC-Midfluent (post lead vessels)
J1S-MID-2 GAC-Midfluent (post lag vessels)
J1S-EFF System effluent

Temp = temperature
SpC = specific conductivity
DO = dissolved oxygen
ORP = oxidation reduction potential
Turb = turbidity
pH = pH

°C = degrees Celsius
µS/cm = microsiemens per centimeter
mg/L = milligrams per liter (parts per million)
mV = millivolts
ntu = nephelometric turbidity units

Breakthrough Detected

Where duplicate sample results were available, the result presented is the average of the original and duplicate samples.

Table 4-1
Groundwater Level Data for the J-1 Range Southern Monitoring Network- 2011

Well	Well Information						Water Levels (ft msl)						
							Start-Up Conditions		Previous Year Data				Current Reporting Period
	Easting Coordinate on Surface (UTM 83m)	Northing Coordinate on Surface (UTM 83m)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)	Mid Screen Elevation (ft msl)	10/8/07 Pre-Startup (no pumping)	10/15/07 Post-startup (pumping)	10/16/08 (pumping)	5/11/2009 (pumping)	11/04/2009 (pumping)	11/8/2010 (pumping)	10/24/2011 (pumping)
90MW0033	374224.93	4616203.49	-2.63	-7.63	5	-5.13	NM	NM	NM	NM	70.32	72.35	71.57
90MW0036	373998.29	4616722.27	19.35	14.35	5	16.85	72.00	71.86	70.12	70.47	71.02	73.45	72.52
90MW0037	374009.46	4616875.59	47.21	42.21	5	44.71	72.40	72.26	70.48	70.66	71.28	73.92	72.93
90MW0041	373822.57	4616885.61	34.23	29.23	5	31.73	72.38	72.21	70.32	70.59	71.17	73.86	72.85
90MW0052	374192.82	4616629.11	34.87	29.87	5	32.37	71.81	71.73	70.02	70.34	70.9	73.24	72.39
90WT0010	374687.81	4616174.31	69.05	59.05	10	64.05	NM	NM	NM	NM	69.36	71.33	70.70
BH70-A	373882.40	4617358.90	59.38	49.38	10	54.38	73.26	73.05	70.85	70.85	71.52	74.4	73.25
DP-379	374279.30	4617053.70	-28.98	-33.98	5	-31.48	72.49	72.28	70.17	70.29	71.03	73.81	72.77
J1SEW0001	374216.22	4616909.10	42.00	2.00	40	22.00	72.35*	69.99*	68.65*	69.58	70.55	72.79	72.70
MW-131M2	374087.46	4617257.67	-27.70	-37.70	10	-32.70	72.75	72.59	70.48	70.54	71.27	75.18	73.04
MW-131S	374087.46	4617257.94	71.30	61.30	10	66.30	73.02	72.85	70.62	70.71	71.42	74.34	73.22
MW-290M3	373814.00	4617213.43	20.03	10.03	10	15.03	73.01	72.90	70.72	70.78	72.48#	74.44	73.33
MW-290S	373814.10	4617213.53	64.20	54.20	10	59.20	72.93	72.79	70.65	70.72	71.41	74.39	73.27
MW-360M1	374053.41	4617207.50	-81.89	-91.89	10	-86.89	72.70	72.60	70.47	70.48	71.23	74.13	73.01
MW-360M2	374053.41	4617207.55	63.11	53.11	10	58.11	72.70	72.56	70.64	70.69	71.4	74.27	73.18
MW-398M1	374215.37	4616912.52	-10.72	-20.72	10	-15.72	72.35	72.11	70.62	70.79#	71.5#	73.64	72.68
MW-398M2	374215.37	4616912.57	29.90	19.90	10	24.90	72.30	71.70	70.31	70.54#	71.35#	73.5	72.55
MW-400M1	374500.73	4616446.25	-55.78	-65.78	10	-60.78	71.27	71.13	69.54	69.82	70.39	72.41	71.68
MW-400M2	374500.73	4616446.30	-1.92	-11.92	10	-6.92	71.33	71.20	69.55	69.89	70.43	72.45	71.71
MW-400PZ	374500.73	4616446.35	72.32	62.32	10	67.32	71.02	70.88	69.05	69.90	70.45	72.41	71.69
MW-402M1	374419.04	4616370.07	-49.25	-59.25	10	-54.25	NM	NM	NM	NM	70.29	72.28	71.48
MW-402M2	374419.04	4616370.17	-14.35	-24.35	10	-19.35	NM	NM	NM	NM	70.32	72.3	71.60
MW-402PZ	374419.04	4616370.12	71.16	61.16	10	66.16	NM	NM	NM	NM	70.88	72.44	70.38
MW-403M1	374595.24	4616509.65	-12.18	-22.18	10	-17.18	NM	NM	NM	NM	70.45	72.46	71.73
MW-403M2	374595.24	4616509.70	20.46	10.46	10	15.46	NM	NM	NM	NM	70.46	72.46	71.74
MW-480M2	374236.96	4616720.82	9.56	-0.44	10	4.56	71.92	71.89	70.18	70.49	71.07	73.39	72.33
MW-481M1	374301.48	4616793.53	-33.58	-43.58	10	-38.58	71.98	71.82	70.16	70.39	71.00	73.36	72.50
MW-481M2	374301.48	4616793.58	9.88	-0.12	10	4.88	71.95	71.79	70.15	70.37	71.01	73.37	72.50
MW-482M2	374371.20	4616838.28	-16.63	-26.63	10	-21.63	72.04	71.87	70.10	70.35	71.01	73.39	72.45

Table 4-1
Groundwater Level Data for the J-1 Range Southern Monitoring Network- 2011

Well	Well Information						Water Levels (ft msl)						
							Start-Up Conditions		Previous Year Data				Current Reporting Period
	Easting Coordinate on Surface (UTM 83m)	Northing Coordinate on Surface (UTM 83m)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)	Mid Screen Elevation (ft msl)	10/8/07 Pre-Startup (no pumping)	10/15/07 Post-startup (pumping)	10/16/08 (pumping)	5/11/2009 (pumping)	11/04/2009 (pumping)	11/8/2010 (pumping)	10/24/2011 (pumping)
MW-482M3	374371.20	4616838.33	58.08	48.08	10	53.08	71.96	MAL	70.41	70.58	71.25	73.62	72.76
MW-483M1	374177.28	4616833.47	22.61	12.61	10	17.61	72.19	72.03	69.65	70.23	70.8	73.33	72.09
MW-483PZ	374177.28	4616833.52	56.71	46.71	10	51.71	71.52	71.33	69.59	69.90	70.44	73	71.95
MW-488M1	374226.99	4616942.30	12.8	2.8	10	7.80	72.35	72.02	70.22	70.42	71.12	74.01	72.73
MW-488PZ	374226.99	4616942.35	43.14	33.14	10	38.14	72.50	72.15	70.07	70.21	70.95	73.89	72.61
537-0107**	373685.29	4617553.59	79.95	60.41	20	70.18	73.33	73.2	70.88	70.72	71.47	74.79	73.59
MW-521M1	374298.79	4616623.11	-21.74	-31.74	10	-26.74	NM	NM	NM	NM	NM	73.14	72.31
MW-521M2	374298.85	4616623.05	34.26	24.26	10	29.26	NM	NM	NM	NM	NM	73.14	72.31
MW-522M1	374362.82	4616535.73	-46.26	-56.26	10	-51.26	NM	NM	NM	NM	NM	72.85	72.06
MW-522M2	374362.76	4616535.67	-13.26	-23.26	10	-18.26	NM	NM	NM	NM	NM	72.8	71.99
MW-522PZ	373362.73	4616535.63	-118	-128.00	10	-123.00	NM	NM	NM	NM	NM	72.73	71.93
MW-523M1	374291.92	4616435.92	-9.83	-19.83	10	-14.83	NM	NM	NM	NM	NM	72.75	71.97
MW-523PZ	374291.86	4616435.86	34.17	24.17	10	29.17	NM	NM	NM	NM	NM	72.78	72.00
MW-524M1	374444.13	4616680.74	6.32	-3.68	10	1.32	NM	NM	NM	NM	NM	72.98	72.16
MW-524PZ	374444.07	4616680.68	35.32	25.32	10	30.32	NM	NM	NM	NM	NM	72.9	72.09
MW-525M1	374448.87	4616268.90	-19.61	-29.61	10	-24.61	NM	NM	NM	NM	NM	72.2	71.48
MW-525M2	374448.87	4616268.84	4.39	-5.61	10	-0.61	NM	NM	NM	NM	NM	72.18	71.46
MW-526M1	374367.27	4616279.41	-11.28	-21.28	10	-16.28	NM	NM	NM	NM	NM	72.37	71.63
MW-526PZ	374367.21	4616279.35	35.72	25.72	10	30.72	NM	NM	NM	NM	NM	72.37	71.62
MW-527M1	374287.37	4616286.13	-13.38	-23.38	10	-18.38	NM	NM	NM	NM	NM	72.49	71.73
MW-527PZ	374287.31	4616286.07	33.62	23.62	10	28.62	NM	NM	NM	NM	NM	72.43	71.66
MW-528M1	374108.09	4617066.70	39.68	29.68	10	34.68	NM	NM	NM	NM	NM	73.69#	72.67

Notes:
ft msl = feet mean sea level
MAL = malfunction of data logger
UTM 83m = Universal Transverse Mercator North American Datum 1983 meters
NAD27 ft = North American Datum of 1927 - MA State Plane Coordinates in feet
NM = not measured
* = derived from regional trend analysis
** = This well is not officially part of the hydraulic monitoring program. Should USGS stop monitoring this well, or should the telemetry for this well go dow
data may not be available during a synoptic gauging round
= Water Level elevations are inconsistent with regional trend measurements

Table 4-2
Analysis of Groundwater Level Data for the J-1 Range Southern Monitoring Network- 2011

Well	Water Levels (ft msl)							Water Level Change (ft)				
	Start-Up Conditions		Previous Year Data				Current Reporting Period	Previous Year Data				Current Reporting Period
	10/8/07 (no pumping)	10/15/07 (pumping)	10/16/08 (pumping)	5/11/2009 (pumping)	11/04/2009 (pumping)	11/8/2010 (pumping)	10/24/2011 (pumping)	From 10/16/08 to 05/11/09	From 05/11/09 to 11/04/2009	From 10/16/08 to 11/04/2009	From 11/04/2009 to 11/08/2010	From 11/08/2010 to 10/24/2011
90MW0033	NM	NM	NM	NM	70.32	72.35	71.57	NA	NA	NA	2.03	-0.78
90MW0036	72.00	71.86	70.12	70.47	71.02	73.45	72.52	0.35	0.55	0.90	2.43	-0.93
90MW0037	72.40	72.26	70.48	70.66	71.28	73.92	72.93	0.18	0.62	0.80	2.64	-0.99
90MW0041	72.38	72.21	70.32	70.59	71.17	73.86	72.85	0.27	0.58	0.85	2.69	-1.01
90MW0052	71.81	71.73	70.02	70.34	70.90	73.24	72.39	0.32	0.56	0.88	2.34	-0.85
90WT0010	NM	NM	NM	NM	69.36	71.33	70.70	NA	NA	NA	1.97	-0.63
BH70-A	73.26	73.05	70.85	70.85	71.52	74.4	73.25	0.00	0.67	0.67	2.88	-1.15
DP-379	72.49	72.28	70.17	70.29	71.03	73.81	72.77	0.12	0.74	0.86	2.78	-1.04
J1SEW0001	72.35*	69.99*	68.65	69.58	70.55	72.79	72.70	0.93	0.97	1.90	2.24	-0.09
MW-131M2	72.75	72.59	70.48	70.54	71.27	75.18	73.04	0.06	0.73	0.79	3.91	-2.14
MW-131S	73.02	72.85	70.62	70.71	71.42	74.34	73.22	0.09	0.71	0.80	2.92	-1.12
MW-290M3	73.01	72.90	70.72	70.78	72.48#	74.44	73.33	0.06	1.70	1.76	1.96	-1.11
MW-290S	72.93	72.79	70.65	70.72	71.41	74.39	73.27	0.07	0.69	0.76	2.98	-1.12
MW-360M1	72.70	72.60	70.47	70.48	71.23	74.13	73.01	0.01	0.75	0.76	2.90	-1.12
MW-360M2	72.70	72.56	70.64	70.69	71.40	74.27	73.18	0.05	0.71	0.76	2.87	-1.09
MW-398M1	72.35	72.11	70.62	70.79	71.50	73.64	72.68	0.17	0.71	0.88	2.14	-0.96
MW-398M2	72.30	71.70	70.31	70.54	71.35	73.5	72.55	0.23	0.81	1.04	2.15	-0.95
MW-400M1	71.27	71.13	69.54	69.82	70.39	72.41	71.68	0.28	0.57	0.85	2.02	-0.73
MW-400M2	71.33	71.20	69.55	69.89	70.43	72.45	71.71	0.34	0.54	0.88	2.02	-0.74
MW-400PZ	71.02	70.88	69.05	69.90	70.45	72.41	71.69	0.85	0.55	1.40	1.96	-0.72
MW-402M1	NM	NM	NM	NM	70.29	72.28	71.48	NA	NA	NA	1.99	-0.80
MW-402M2	NM	NM	NM	NM	70.32	72.3	71.60	NA	NA	NA	1.98	-0.70
MW-402PZ	NM	NM	NM	NM	70.88	72.44	70.38	NA	NA	NA	1.56	-2.06
MW-403M1	NM	NM	NM	NM	70.45	72.46	71.73	NA	NA	NA	2.01	-0.73
MW-403M2	NM	NM	NM	NM	70.46	72.46	71.74	NA	NA	NA	2.00	-0.72
MW-480M2	71.92	71.89	70.18	70.49	71.07	73.39	72.33	0.31	0.58	0.89	2.32	-1.06
MW-481M1	71.98	71.82	70.16	70.39	71.00	73.36	72.50	0.23	0.61	0.84	2.36	-0.86
MW-481M2	71.95	71.79	70.15	70.37	71.01	73.37	72.50	0.22	0.64	0.86	2.36	-0.87
MW-482M2	72.04	71.87	70.10	70.35	71.01	73.39	72.45	0.25	0.66	0.91	2.38	-0.94
MW-482M3	71.96	MAL	70.41	70.58	71.25	73.62	72.76	NA	NA	0.84	2.37	-0.86
MW-483M1	72.19	72.03	69.65	70.23	70.80	73.33	72.09	0.58	0.57	1.15	2.53	-1.24
MW-483PZ	71.52	71.33	69.59	69.90	70.44	73	71.95	0.31	0.54	0.85	2.56	-1.05
MW-488M1	72.35	72.02	70.22	70.42	71.12	74.01	72.73	0.20	0.70	0.90	2.89	-1.28
MW-488PZ	72.50	72.15	70.07	70.21	70.95	73.89	72.61	0.14	0.74	0.88	2.94	-1.28
537-0107**	73.33	73.2	70.88	70.72	71.47	74.79	73.59	-0.16	0.75	0.59	3.32	-1.20
MW-521M1	NA	NA	NA	NA	NA	73.14	72.31	NA	NA	NA	NA	-0.83
MW-521M2	NA	NA	NA	NA	NA	73.14	72.31	NA	NA	NA	NA	-0.83
MW-522M1	NA	NA	NA	NA	NA	72.85	72.06	NA	NA	NA	NA	-0.79

Table 4-2
Analysis of Groundwater Level Data for the J-1 Range Southern Monitoring Network- 2011

Well	Water Levels (ft msl)							Water Level Change (ft)				
	Start-Up Conditions		Previous Year Data				Current Reporting Period	Previous Year Data				Current Reporting Period
	10/8/07 (no pumping)	10/15/07 (pumping)	10/16/08 (pumping)	5/11/2009 (pumping)	11/04/2009 (pumping)	11/8/2010 (pumping)	10/24/2011 (pumping)	From 10/16/08 to 05/11/09	From 05/11/09 to 11/04/2009	From 10/16/08 to 11/04/2009	From 11/04/2009 to 11/08/2010	From 11/08/2010 to 10/24/2011
MW-522M2	NA	NA	NA	NA	NA	72.8	71.99	NA	NA	NA	NA	-0.81
MW-522PZ	NA	NA	NA	NA	NA	72.73	71.93	NA	NA	NA	NA	-0.80
MW-523M1	NA	NA	NA	NA	NA	72.75	71.97	NA	NA	NA	NA	-0.78
MW-523PZ	NA	NA	NA	NA	NA	72.78	72.00	NA	NA	NA	NA	-0.78
MW-524M1	NA	NA	NA	NA	NA	72.98	72.16	NA	NA	NA	NA	-0.82
MW-524PZ	NA	NA	NA	NA	NA	72.9	72.09	NA	NA	NA	NA	-0.81
MW-525M1	NA	NA	NA	NA	NA	72.2	71.48	NA	NA	NA	NA	-0.72
MW-525M2	NA	NA	NA	NA	NA	72.18	71.46	NA	NA	NA	NA	-0.72
MW-526M1	NA	NA	NA	NA	NA	72.37	71.63	NA	NA	NA	NA	-0.74
MW-526PZ	NA	NA	NA	NA	NA	72.37	71.62	NA	NA	NA	NA	-0.75
MW-527M1	NA	NA	NA	NA	NA	72.49	71.73	NA	NA	NA	NA	-0.76
MW-527PZ	NA	NA	NA	NA	NA	72.43	71.66	NA	NA	NA	NA	-0.77
MW-528M1	NA	NA	NA	NA	NA	73.69#	72.67	NA	NA	NA	NA	-1.02

Notes:
ft = feet
ft msl = feet mean sea level
MAL = malfunction of data logger
NA = not applicable
NM = not measured
* = derived from regional trend analysis
** = This well is not officially part of the hydraulic monitoring program. Should USGS stop monitoring this well, or should the telemetry for this well go dow
data may not be available during a synoptic gauging round
= Water Level elevations are inconsistent with regional trend measurement

Table 5-1
J-1 Range Southern Groundwater Monitoring Well Results- 2011

Location	Sample Type	Analyte	Test Method	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Top of Screen (ft msl)	Bottom of Screen (ft msl)	Log Date
DP-379	N1	ND for 19 Analytes	SW8330	ND	U	ND	-24.73	-29.73	10/25/2011
DP-379	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	-24.73	-29.73	10/25/2011
DP-389	N1	ND for 19 Analytes	SW8330	ND	U	ND	-2.25	-7.25	10/26/2011
DP-389	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	-2.25	-7.25	10/26/2011
MW-131S	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	71.3	61.3	10/27/2011
MW-360M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	0.25	J	0.21	63.11	53.11	11/01/2011
MW-360M2	N1	ND for 18 Analytes	SW8330	ND	UJ	ND	63.11	53.11	11/01/2011
MW-360M2	FD1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	0.25	J	0.21	63.11	53.11	11/01/2011
MW-360M2	FD1	ND for 18 Analytes	SW8330	ND	UJ	ND	63.11	53.11	11/01/2011
MW-360M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	2.3		0.21	63.11	53.11	05/05/2011
MW-360M2	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	SW8330	0.53		0.21	63.11	53.11	05/05/2011
MW-360M2	N1	ND for 17 Analytes	SW8330	ND	U	ND	63.11	53.11	05/05/2011
MW-360M2	N1	ND for 17 Analytes	SW8330	ND	UJ	ND	63.11	53.11	05/05/2011
MW-398M1	N1	ND for 19 Analytes	SW8330	ND	U	ND	-10.77	-20.77	11/01/2011
MW-398M1	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	-10.77	-20.77	11/01/2011
MW-398M2	N1	ND for 19 Analytes	SW8330	ND	U	ND	29.93	19.93	11/01/2011
MW-398M2	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	29.93	19.93	11/01/2011
MW-400M1	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	-55.63	-65.63	11/02/2011
MW-400M2	N1	ND for 19 Analytes	SW8330	ND	U	ND	-1.73	-11.73	11/02/2011
MW-400M2	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	-1.73	-11.73	11/02/2011
MW-402M1	N1	ND for 19 Analytes	SW8330	ND	U	ND	-52.93	-62.93	11/03/2011
MW-402M1	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	-52.93	-62.93	11/03/2011

Table 5-1
J-1 Range Southern Groundwater Monitoring Well Results- 2011

Location	Sample Type	Analyte	Test Method	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Top of Screen (ft msl)	Bottom of Screen (ft msl)	Log Date
MW-402M2	N1	ND for 19 Analytes	SW8330	ND	U	ND	-18.03	-28.13	11/03/2011
MW-402M2	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	-18.03	-28.13	11/03/2011
MW-402M2	N1	ND for 19 Analytes	SW8330	ND	U	ND	-18.03	-28.13	05/04/2011
MW-402M2	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	-18.03	-28.13	05/04/2011
MW-403M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	0.47		0.23	-12.18	-22.18	11/01/2011
MW-403M1	N1	ND for 18 Analytes	SW8330	ND	U	ND	-12.18	-22.18	11/01/2011
MW-403M1	N1	ND for 18 Analytes	SW8330	ND	UJ	ND	-12.18	-22.18	11/01/2011
MW-403M2	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	20.42	10.32	11/01/2011
MW-480M2	N1	ND for 19 Analytes	SW8330	ND	U	ND	9.53	-0.47	11/03/2011
MW-480M2	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	9.53	-0.47	11/03/2011
MW-481M1	N1	ND for 19 Analytes	SW8330	ND	U	ND	-33.54	-43.54	11/02/2011
MW-481M1	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	-33.54	-43.54	11/02/2011
MW-481M2	N1	ND for 19 Analytes	SW8330	ND	U	ND	9.86	-0.14	11/02/2011
MW-481M2	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	9.86	-0.14	11/02/2011
MW-481M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	0.25		0.21	9.86	-0.14	05/03/2011
MW-481M2	N1	ND for 18 Analytes	SW8330	ND	U	ND	9.86	-0.14	05/03/2011
MW-481M2	N1	ND for 18 Analytes	SW8330	ND	UJ	ND	9.86	-0.14	05/03/2011
MW-482M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	1.7		0.23	-16.59	-26.59	11/02/2011
MW-482M2	N1	ND for 18 Analytes	SW8330	ND	U	ND	-16.59	-26.59	11/02/2011
MW-482M2	N1	ND for 18 Analytes	SW8330	ND	UJ	ND	-16.59	-26.59	11/02/2011
MW-482M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	1.0		0.22	-16.59	-26.59	05/03/2011
MW-482M2	N1	ND for 18 Analytes	SW8330	ND	U	ND	-16.59	-26.59	05/03/2011
MW-482M2	N1	ND for 18 Analytes	SW8330	ND	UJ	ND	-16.59	-26.59	05/03/2011
MW-482M3	N1	ND for 19 Analytes	SW8330	ND	U	ND	58.06	48.06	11/02/2011
MW-482M3	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	58.06	48.06	11/02/2011
MW-483M1	N1	ND for 19 Analytes	SW8330	ND	U	ND	22.63	12.63	10/27/2011
MW-483M1	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	22.63	12.63	10/27/2011

Table 5-1
J-1 Range Southern Groundwater Monitoring Well Results- 2011

Location	Sample Type	Analyte	Test Method	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Top of Screen (ft msl)	Bottom of Screen (ft msl)	Log Date
MW-488M1	N1	ND for 19 Analytes	SW8330	ND	U	ND	12.82	2.82	10/26/2011
MW-488M1	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	12.82	2.82	10/26/2011
MW-488PZ	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	2.7		0.22	43.12	33.12	10/25/2011
MW-488PZ	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	SW8330	0.43		0.22	43.12	33.12	10/25/2011
MW-488PZ	N1	ND for 17 Analytes	SW8330	ND	U	ND	43.12	33.12	10/25/2011
MW-488PZ	N1	ND for 17 Analytes	SW8330	ND	UJ	ND	43.12	33.12	10/25/2011
MW-521M1	N1	ND for 19 Analytes	SW8330	ND	U	ND	-21.74	-31.74	11/07/2011
MW-522M1	N1	ND for 19 Analytes	SW8330	ND	U	ND	-46.26	-56.26	11/07/2011
MW-522M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	0.22		0.21	-46.26	-56.26	05/05/2011
MW-522M1	N1	ND for 18 Analytes	SW8330	ND	U	ND	-46.26	-56.26	05/05/2011
MW-522M1	N1	ND for 18 Analytes	SW8330	ND	UJ	ND	-46.26	-56.26	05/05/2011
MW-522M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	1.4		0.20	-13.26	-23.26	11/07/2011
MW-522M2	N1	ND for 18 Analytes	SW8330	ND	U	ND	-13.26	-23.26	11/07/2011
MW-522M2	FD1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	1.4		0.20	-13.26	-23.26	11/07/2011
MW-522M2	FD1	ND for 18 Analytes	SW8330	ND	U	ND	-13.26	-23.26	11/07/2011
MW-522M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	1.4		0.21	-13.26	-23.26	05/05/2011
MW-522M2	N1	ND for 18 Analytes	SW8330	ND	U	ND	-13.26	-23.26	05/05/2011
MW-522M2	N1	ND for 18 Analytes	SW8330	ND	UJ	ND	-13.26	-23.26	05/05/2011
MW-523M1	N1	ND for 19 Analytes	SW8330	ND	U	ND	-9.83	-19.83	11/07/2011

Table 5-1
J-1 Range Southern Groundwater Monitoring Well Results- 2011

Location	Sample Type	Analyte	Test Method	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Top of Screen (ft msl)	Bottom of Screen (ft msl)	Log Date
MW-524M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	55.7		0.80	6.32	-3.68	11/08/2011
MW-524M1	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	SW8330	8.4		0.20	6.32	-3.68	11/08/2011
MW-524M1	N1	ND for 17 Analytes	SW8330	ND	U	ND	6.32	-3.68	11/08/2011
MW-524M1	FD1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	54.6		0.80	6.32	-3.68	11/08/2011
MW-524M1	FD1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	SW8330	8.2		0.20	6.32	-3.68	11/08/2011
MW-524M1	FD1	ND for 17 Analytes	SW8330	ND	U	ND	6.32	-3.68	11/08/2011
MW-524M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	76.1		4.4	6.32	-3.68	05/04/2011
MW-524M1	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	SW8330	5.2		0.22	6.32	-3.68	05/04/2011
MW-524M1	N1	ND for 17 Analytes	SW8330	ND	U	ND	6.32	-3.68	05/04/2011
MW-524M1	N1	ND for 17 Analytes	SW8330	ND	UJ	ND	6.32	-3.68	05/04/2011
MW-524M1	FD1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	73.8		4.2	6.32	-3.68	05/04/2011
MW-524M1	FD1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	SW8330	4.8		0.21	6.32	-3.68	05/04/2011
MW-524M1	FD1	ND for 17 Analytes	SW8330	ND	U	ND	6.32	-3.68	05/04/2011
MW-524M1	FD1	ND for 17 Analytes	SW8330	ND	UJ	ND	6.32	-3.68	05/04/2011
MW-525M1	N1	ND for 19 Analytes	SW8330	ND	U	ND	-19.61	-29.61	11/07/2011
MW-525M1	N1	ND for 19 Analytes	SW8330	ND	U	ND	-19.61	-29.61	05/04/2011
MW-525M1	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	-19.61	-29.61	05/04/2011
MW-525M2	N1	ND for 19 Analytes	SW8330	ND	U	ND	4.39	-5.61	11/07/2011
MW-525M2	N1	ND for 19 Analytes	SW8330	ND	U	ND	4.39	-5.61	05/04/2011
MW-525M2	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	4.39	-5.61	05/04/2011
MW-526M1	N1	ND for 19 Analytes	SW8330	ND	U	ND	-11.28	-21.28	11/08/2011
MW-526M1	N1	ND for 19 Analytes	SW8330	ND	U	ND	-11.28	-21.28	05/04/2011
MW-526M1	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	-11.28	-21.28	05/04/2011
MW-527M1	N1	ND for 19 Analytes	SW8330	ND	U	ND	-13.38	-23.38	11/08/2011
MW-527M1	N1	ND for 19 Analytes	SW8330	ND	U	ND	-13.38	-23.38	05/04/2011
MW-527M1	N1	ND for 19 Analytes	SW8330	ND	UJ	ND	-13.38	-23.38	05/04/2011

Table 5-1
J-1 Range Southern Groundwater Monitoring Well Results- 2011

Location	Sample Type	Analyte	Test Method	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Top of Screen (ft msl)	Bottom of Screen (ft msl)	Log Date
MW-528M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	0.41		0.20	39.68	29.68	11/08/2011
MW-528M1	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	SW8330	0.24		0.20	39.68	29.68	11/08/2011
MW-528M1	N1	ND for 17 Analytes	SW8330	ND	U	ND	39.68	29.68	11/08/2011
MW-528M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	1.2		0.21	39.68	29.68	05/05/2011
MW-528M1	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	SW8330	0.58		0.21	39.68	29.68	05/05/2011
MW-528M1	N1	ND for 17 Analytes	SW8330	ND	U	ND	39.68	29.68	05/05/2011
MW-528M1	N1	ND for 17 Analytes	SW8330	ND	UJ	ND	39.68	29.68	05/05/2011

Notes:

N1 = normal field sample
U = not detected
J = estimated
ND = not detected
FD1 = field duplicate
Log Date = field sampling date
LR = lab replicate
ug/L = micrograms per liter (parts per billion)
ft msl = feet relative to mean sea level
VOC = volatile organic compound
SVOC = semivolatile organic compound
HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine

Table 6-1
J-1 Range Southern Model vs. Observed Groundwater Monitoring Well Results- 2011

Location	Sample Type	Analyte	Test Method	Model Predicted RDX (ug/L)	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Top of Screen (ft msl)	Bottom of Screen (ft msl)	Log Date
DP-379	N1	ND for 19 Analytes	SW8330	ND	ND	U	ND	-24.73	-29.73	10/25/2011
DP-379	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	-24.73	-29.73	10/25/2011
DP-389	N1	ND for 19 Analytes	SW8330	0.16	ND	U	ND	-2.25	-7.25	10/26/2011
DP-389	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	-2.25	-7.25	10/26/2011
MW-131S	N1	ND for 19 Analytes	SW8330	ND	ND	UJ	ND	71.3	61.3	10/27/2011
MW-360M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	0.017	0.25	J	0.21	63.11	53.11	11/01/2011
MW-360M2	N1	ND for 18 Analytes	SW8330		ND	UJ	ND	63.11	53.11	11/01/2011
MW-360M2	FD1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330		0.25	J	0.21	63.11	53.11	11/01/2011
MW-360M2	FD1	ND for 18 Analytes	SW8330		ND	UJ	ND	63.11	53.11	11/01/2011
MW-360M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	0.06	2.3		0.21	63.11	53.11	05/05/2011
MW-360M2	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	SW8330		0.53		0.21	63.11	53.11	05/05/2011
MW-360M2	N1	ND for 17 Analytes	SW8330		ND	U	ND	63.11	53.11	05/05/2011
MW-360M2	N1	ND for 17 Analytes	SW8330		ND	UJ	ND	63.11	53.11	05/05/2011
MW-398M1	N1	ND for 19 Analytes	SW8330	0.004	ND	U	ND	-10.77	-20.77	11/01/2011
MW-398M1	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	-10.77	-20.77	11/01/2011
MW-398M2	N1	ND for 19 Analytes	SW8330	0.41	ND	U	ND	29.93	19.93	11/01/2011
MW-398M2	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	29.93	19.93	11/01/2011
MW-400M1	N1	ND for 19 Analytes	SW8330	ND	ND	UJ	ND	-55.63	-65.63	11/02/2011
MW-400M2	N1	ND for 19 Analytes	SW8330	0.42	ND	U	ND	-1.73	-11.73	11/02/2011
MW-400M2	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	-1.73	-11.73	11/02/2011
MW-402M1	N1	ND for 19 Analytes	SW8330	0.02	ND	U	ND	-52.93	-62.93	11/03/2011
MW-402M1	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	-52.93	-62.93	11/03/2011

Table 6-1
J-1 Range Southern Model vs. Observed Groundwater Monitoring Well Results- 2011

Location	Sample Type	Analyte	Test Method	Model Predicted RDX (ug/L)	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Top of Screen (ft msl)	Bottom of Screen (ft msl)	Log Date
MW-402M2	N1	ND for 19 Analytes	SW8330	0.88	ND	U	ND	-18.03	-28.13	11/03/2011
MW-402M2	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	-18.03	-28.13	11/03/2011
MW-402M2	N1	ND for 19 Analytes	SW8330	0.79	ND	U	ND	-18.03	-28.13	05/04/2011
MW-402M2	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	-18.03	-28.13	05/04/2011
MW-403M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	0.0012	0.47		0.23	-12.18	-22.18	11/01/2011
MW-403M1	N1	ND for 18 Analytes	SW8330		ND	U	ND	-12.18	-22.18	11/01/2011
MW-403M1	N1	ND for 18 Analytes	SW8330		ND	UJ	ND	-12.18	-22.18	11/01/2011
MW-403M2	N1	ND for 19 Analytes	SW8330	ND	ND	UJ	ND	20.42	10.32	11/01/2011
MW-480M2	N1	ND for 19 Analytes	SW8330	0.03	ND	U	ND	9.53	-0.47	11/03/2011
MW-480M2	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	9.53	-0.47	11/03/2011
MW-481M1	N1	ND for 19 Analytes	SW8330	0.006	ND	U	ND	-33.54	-43.54	11/02/2011
MW-481M1	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	-33.54	-43.54	11/02/2011
MW-481M2	N1	ND for 19 Analytes	SW8330	5.13	ND	U	ND	9.86	-0.14	11/02/2011
MW-481M2	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	9.86	-0.14	11/02/2011
MW-481M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	7.33	0.25		0.21	9.86	-0.14	05/03/2011
MW-481M2	N1	ND for 18 Analytes	SW8330		ND	U	ND	9.86	-0.14	05/03/2011
MW-481M2	N1	ND for 18 Analytes	SW8330		ND	UJ	ND	9.86	-0.14	05/03/2011
MW-482M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	0.24	1.7		0.23	-16.59	-26.59	11/02/2011
MW-482M2	N1	ND for 18 Analytes	SW8330		ND	U	ND	-16.59	-26.59	11/02/2011
MW-482M2	N1	ND for 18 Analytes	SW8330		ND	UJ	ND	-16.59	-26.59	11/02/2011
MW-482M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	0.31	1.0		0.22	-16.59	-26.59	05/03/2011
MW-482M2	N1	ND for 18 Analytes	SW8330		ND	U	ND	-16.59	-26.59	05/03/2011
MW-482M2	N1	ND for 18 Analytes	SW8330		ND	UJ	ND	-16.59	-26.59	05/03/2011
MW-482M3	N1	ND for 19 Analytes	SW8330	ND	ND	U	ND	58.06	48.06	11/02/2011
MW-482M3	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	58.06	48.06	11/02/2011
MW-483M1	N1	ND for 19 Analytes	SW8330	ND	ND	U	ND	22.63	12.63	10/27/2011
MW-483M1	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	22.63	12.63	10/27/2011

Table 6-1
J-1 Range Southern Model vs. Observed Groundwater Monitoring Well Results- 2011

Location	Sample Type	Analyte	Test Method	Model Predicted RDX (ug/L)	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Top of Screen (ft msl)	Bottom of Screen (ft msl)	Log Date
MW-488M1	N1	ND for 19 Analytes	SW8330	0.21	ND	U	ND	12.82	2.82	10/26/2011
MW-488M1	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	12.82	2.82	10/26/2011
MW-488PZ	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	0.05	2.7		0.22	43.12	33.12	10/25/2011
MW-488PZ	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	SW8330		0.43		0.22	43.12	33.12	10/25/2011
MW-488PZ	N1	ND for 17 Analytes	SW8330		ND	U	ND	43.12	33.12	10/25/2011
MW-488PZ	N1	ND for 17 Analytes	SW8330		ND	UJ	ND	43.12	33.12	10/25/2011
MW-521M1	N1	ND for 19 Analytes	SW8330	0.73	ND	U	ND	-21.74	-31.74	11/07/2011
MW-522M1	N1	ND for 19 Analytes	SW8330	0.19	ND	U	ND	-46.26	-56.26	11/07/2011
MW-522M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	0.29	0.22		0.21	-46.26	-56.26	05/05/2011
MW-522M1	N1	ND for 18 Analytes	SW8330		ND	U	ND	-46.26	-56.26	05/05/2011
MW-522M1	N1	ND for 18 Analytes	SW8330		ND	UJ	ND	-46.26	-56.26	05/05/2011
MW-522M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	0.54	1.4		0.20	-13.26	-23.26	11/07/2011
MW-522M2	N1	ND for 18 Analytes	SW8330		ND	U	ND	-13.26	-23.26	11/07/2011
MW-522M2	FD1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330		1.4		0.20	-13.26	-23.26	11/07/2011
MW-522M2	FD1	ND for 18 Analytes	SW8330		ND	U	ND	-13.26	-23.26	11/07/2011
MW-522M2	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	0.47	1.4		0.21	-13.26	-23.26	05/05/2011
MW-522M2	N1	ND for 18 Analytes	SW8330		ND	U	ND	-13.26	-23.26	05/05/2011
MW-522M2	N1	ND for 18 Analytes	SW8330		ND	UJ	ND	-13.26	-23.26	05/05/2011
MW-523M1	N1	ND for 19 Analytes	SW8330	0.26	ND	U	ND	-9.83	-19.83	11/07/2011

Table 6-1
J-1 Range Southern Model vs. Observed Groundwater Monitoring Well Results- 2011

Location	Sample Type	Analyte	Test Method	Model Predicted RDX (ug/L)	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Top of Screen (ft msl)	Bottom of Screen (ft msl)	Log Date
MW-524M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	0.47	55.7		0.80	6.32	-3.68	11/08/2011
MW-524M1	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	SW8330		8.4		0.20	6.32	-3.68	11/08/2011
MW-524M1	N1	ND for 17 Analytes	SW8330		ND	U	ND	6.32	-3.68	11/08/2011
MW-524M1	FD1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330		54.6		0.80	6.32	-3.68	11/08/2011
MW-524M1	FD1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	SW8330		8.2		0.20	6.32	-3.68	11/08/2011
MW-524M1	FD1	ND for 17 Analytes	SW8330		ND	U	ND	6.32	-3.68	11/08/2011
MW-524M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	0.50	76.1		4.4	6.32	-3.68	05/04/2011
MW-524M1	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	SW8330		5.2		0.22	6.32	-3.68	05/04/2011
MW-524M1	N1	ND for 17 Analytes	SW8330		ND	U	ND	6.32	-3.68	05/04/2011
MW-524M1	N1	ND for 17 Analytes	SW8330		ND	UJ	ND	6.32	-3.68	05/04/2011
MW-524M1	FD1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330		73.8		4.2	6.32	-3.68	05/04/2011
MW-524M1	FD1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	SW8330		4.8		0.21	6.32	-3.68	05/04/2011
MW-524M1	FD1	ND for 17 Analytes	SW8330		ND	U	ND	6.32	-3.68	05/04/2011
MW-524M1	FD1	ND for 17 Analytes	SW8330		ND	UJ	ND	6.32	-3.68	05/04/2011
MW-525M1	N1	ND for 19 Analytes	SW8330	0.20	ND	U	ND	-19.61	-29.61	11/07/2011
MW-525M1	N1	ND for 19 Analytes	SW8330	0.15	ND	U	ND	-19.61	-29.61	05/04/2011
MW-525M1	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	-19.61	-29.61	05/04/2011
MW-525M2	N1	ND for 19 Analytes	SW8330	ND	ND	U	ND	4.39	-5.61	11/07/2011
MW-525M2	N1	ND for 19 Analytes	SW8330	ND	ND	U	ND	4.39	-5.61	05/04/2011
MW-525M2	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	4.39	-5.61	05/04/2011
MW-526M1	N1	ND for 19 Analytes	SW8330	0.02	ND	U	ND	-11.28	-21.28	11/08/2011
MW-526M1	N1	ND for 19 Analytes	SW8330	0.01	ND	U	ND	-11.28	-21.28	05/04/2011
MW-526M1	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	-11.28	-21.28	05/04/2011
MW-527M1	N1	ND for 19 Analytes	SW8330	ND	ND	U	ND	-13.38	-23.38	11/08/2011
MW-527M1	N1	ND for 19 Analytes	SW8330	ND	ND	U	ND	-13.38	-23.38	05/04/2011
MW-527M1	N1	ND for 19 Analytes	SW8330		ND	UJ	ND	-13.38	-23.38	05/04/2011

Table 6-1
J-1 Range Southern Model vs. Observed Groundwater Monitoring Well Results- 2011

Location	Sample Type	Analyte	Test Method	Model Predicted RDX (ug/L)	Reported Result (ug/L)	Qualifier	Reporting Limit (ug/L)	Top of Screen (ft msl)	Bottom of Screen (ft msl)	Log Date
MW-528M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	1.58	0.41		0.20	39.68	29.68	11/08/2011
MW-528M1	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	SW8330		0.24		0.20	39.68	29.68	11/08/2011
MW-528M1	N1	ND for 17 Analytes	SW8330		ND	U	ND	39.68	29.68	11/08/2011
MW-528M1	N1	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	SW8330	2.68	1.2		0.21	39.68	29.68	05/05/2011
MW-528M1	N1	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	SW8330		0.58		0.21	39.68	29.68	05/05/2011
MW-528M1	N1	ND for 17 Analytes	SW8330		ND	U	ND	39.68	29.68	05/05/2011
MW-528M1	N1	ND for 17 Analytes	SW8330		ND	UJ	ND	39.68	29.68	05/05/2011

Notes:

N1 = normal field sample
U = not detected
J = estimated
ND = not detected
FD1 = field duplicate
Log Date = field sampling date
LR = lab replicate
ug/L = micrograms per liter (parts per billion)
ft msl = feet relative to mean sea level
VOC = volatile organic compound
SVOC = semivolatile organic compound
HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine

Table 7-1
Proposed J-1 Range Southern Hydraulic Monitoring Network- November 2012

Well	Easting Coordinate on Surface (N83 UTM m)	Northing Coordinate on Surface (N83 UTM m)	Surface Elevation (ft msl)	MP Elev (ft msl)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)	Mid Screen Elevation (ft msl)
90MW0033	374225	4616203	152.10	154.34	-2.63	-7.63	5	-5.13
90MW0036	373998	4616722	124.00	126.31	19.35	14.35	5	16.85
90MW0037	374009	4616876	157.10	156.42	47.21	42.21	5	44.71
90MW0041	373823	4616886	159.60	161.63	34.23	29.23	5	31.73
90MW0052	374193	4616629	129.80	132.50	34.87	29.87	5	32.37
90WT0010	374688	4616174	152.40	151.97	69.05	59.05	10	64.05
BH70-A	373882	4617359	164.88	165.79	59.38	49.38	10	54.38
DP-379	374279	4617054	160.42	162.46	-28.98	-33.98	5	-31.48
J1SEW0001	374216	4616909	N/A	161.35	44	4	40	24
MW-131M2	374087	4617258	167.30	167.02	-27.70	-37.70	10	-32.70
MW-131S	374087	4617258	167.30	167.00	71.30	61.30	10	66.30
MW-290M3	373814	4617213	164.50	163.73	20.03	10.03	10	15.03
MW-290S	373814	4617214	164.30	164.04	64.20	54.20	10	59.20
MW-360M1	374053	4617208	165.11	164.41	-81.89	-91.89	10	-86.89
MW-360M2	374053	4617208	165.11	164.37	63.11	53.11	10	58.11
MW-398M1	374215	4616913	161.43	161.09	-10.72	-20.72	10	-15.72
MW-398M2	374215	4616913	161.43	161.11	29.90	19.90	10	24.90
MW-400M1	374501	4616446	136.98	136.7	-55.78	-65.78	10	-60.78
MW-400M2	374501	4616446	136.98	136.69	-1.92	-11.92	10	-6.92
MW-400PZ	374501	4616446	136.98	136.43	72.32	62.32	10	67.32
MW-402M1	374419	4616370	140.89	140.25	-49.25	-59.25	10	-54.25
MW-402M2	374419	4616370	140.89	140.26	-14.35	-24.35	10	-19.35
MW-402PZ	374419	4616370	140.89	140.02	71.16	61.16	10	66.16
MW-403M1	374595	4616510	147.72	147.09	-12.18	-22.18	10	-17.18
MW-403M2	374595	4616510	147.72	147.09	20.46	10.46	10	15.46
MW-480M2	374237	4616721	153.13	152.77	9.56	-0.44	10	4.56
MW-481M1	374301	4616794	156.16	155.65	-33.58	-43.58	10	-38.58
MW-481M2	374301	4616794	156.16	155.66	9.88	-0.12	10	4.88
MW-482M2	374371	4616838	156.01	155.46	-16.63	-26.63	10	-21.63

Table 7-1
Proposed J-1 Range Southern Hydraulic Monitoring Network- November 2012

Well	Easting Coordinate on Surface (N83 UTM m)	Northing Coordinate on Surface (N83 UTM m)	Surface Elevation (ft msl)	MP Elev (ft msl)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)	Mid Screen Elevation (ft msl)
MW-482M3	374371	4616838	156.26	155.78	58.08	48.08	10	53.08
MW-483M1	374177	4616833	162.13	162.54	22.61	12.61	10	17.61
MW-483PZ	374177	4616834	165.00	162.25	56.71	46.71	10	51.71
MW-488M1	374227	4616942	162.42	162.51	12.8	2.8	10	7.80
MW-488PZ	374227	4616942	162.42	162.51	43.14	33.14	10	38.14
MW-521M1	374299	4616623	136.26	136.13	-21.74	-31.74	10	-26.74
MW-521M2	374299	4616623	136.26	136.09	34.26	24.26	10	29.26
MW-522M1	374363	4616536	151.74	151.43	-46.26	-56.26	10	-51.26
MW-522M2	374363	4616536	151.74	151.42	-13.26	-23.26	10	-18.26
MW-522PZ	373363	4616536	151.74	151.37	33.74	23.74	10	28.74
MW-523M1	374292	4616436	148.17	147.87	-9.83	-19.83	10	-14.83
MW-523PZ	374292	4616436	148.17	147.89	34.17	24.17	10	29.17
MW-524M1	374444	4616681	154.32	154.03	6.32	-3.68	10	1.32
MW-524PZ	374444	4616681	154.32	154.03	35.32	25.32	10	30.32
MW-525M1	374449	4616269	152.39	152.05	-19.61	-29.61	10	-24.61
MW-525M2	374449	4616269	152.39	152.07	4.39	-5.61	10	-0.61
MW-526M1	374367	4616279	152.72	152.44	-11.28	-21.28	10	-16.28
MW-526PZ	374367	4616279	152.72	152.46	35.72	25.72	10	30.72
MW-527M1	374287	4616286	151.62	151.32	-13.38	-23.38	10	-18.38
MW-527PZ	374287	4616286	151.62	151.32	33.62	23.62	10	28.62
MW-528M1	374108	4617067	156.68	156.42	39.68	29.68	10	34.68

ft msl = feet mean sea level
N83UTM m = North American Datum of 1983 Universal Transverse Mercator coordinates in meters

Table 7-2
J-1 Range Southern Groundwater Chemical Monitoring Network- November 2012

Location	Screen Interval (ft msl)			Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Approved Parameters (b)
DP-379	-28.98	to	-33.98	Monitor the northeastern boundary of the J-1 S plume	A	Explosives	A	Explosives
DP-389	-7.26	to	-12.26	Monitor the lower boundary of the J-1 S plume	A	Explosives	A	Explosives
J1SEW0001	42	to	2	Extraction well for J-1 S ETI System, used to help calculate and confirm mass removal by the system	M	Explosives	M	Explosives
MW-131S	71.3	to	61.3	Potential source area well and northern boundary well to monitor explosives	A	Explosives	A	Explosives
MW-360M2	63.11	to	53.11	Monitor the source area and trailing edge of the J-1 S plume	S	Explosives	**A**	Explosives
MW-398M1	-10.72	to	-20.72	Monitor groundwater below core of J-1 S plume	A	Explosives	A	Explosives
MW-398M2	29.9	to	19.9	Monitor core of J-1 S plume	A	Explosives	A	Explosives
MW-400M1	-55.78	to	-65.78	Monitor downgradient of the leading edge of the J-1 S plume	A	Explosives	**S**	Explosives
MW-400M2	-1.92	to	-11.92	Monitor downgradient of the leading edge of the J-1 S plume	A	Explosives	**S**	Explosives
MW-402M1	-49.25	to	-59.25	Monitor downgradient of the leading edge of the J-1 S plume	A	Explosives	**S**	Explosives
MW-402M2	-14.35	to	-24.35	Monitor downgradient of the leading edge of the J-1 S plume	S	Explosives	S	Explosives
MW-403M1	-12.18	to	-22.18	Monitor downgradient of the leading edge of the J-1 S plume	A	Explosives	**S**	Explosives
MW-403M2	20.46	to	10.46	Monitor downgradient of the leading edge of the J-1 S plume	S	Explosives	S	Explosives
MW-480M2	9.56	to	-0.44	Monitor the southwestern boundary of the J-1 S plume	A	Explosives	A	Explosives
MW-481M1	-33.58	to	-43.58	Monitor the core of the J-1 S plume	A	Explosives	A	Explosives
MW-481M2	9.88	to	-0.12	Monitor the core of the J-1 S plume	S	Explosives	**A**	Explosives
MW-482M2	-16.63	to	-26.63	Monitor the northeastern boundary of the J-1 S plume	S	Explosives	**A**	Explosives
MW-482M3	58.08	to	48.08	Monitor the northeastern boundary of the J-1 S plume	A	Explosives	A	Explosives
MW-483M1	22.61	to	12.61	Monitor the southeastern boundary of the J-1 S plume	A	Explosives	A	Explosives

Table 7-2
J-1 Range Southern Groundwater Chemical Monitoring Network- November 2012

Location	Screen Interval (ft msl)			Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Approved Parameters (b)
MW-488M1	12.8	to	2.8	Monitor the core of the J-1 S plume	A	Explosives	A	Explosives
MW-488PZ	43.14	to	33.14	Monitor the upper boundary of the J-1 S plume	A	Explosives	A	Explosives
MW-521M1	-21.74	to	-31.74	Monitor the northwestern edge of the plume south of base boundary	A	Explosives	A	Explosives
MW-522M1	-46.26	to	-56.26	Monitor near core of plume	S	Explosives	**A**	Explosives
MW-522M2	-13.26	to	-23.26	Monitor near core of plume	S	Explosives	**A**	Explosives
MW-523M1	-9.83	to	-19.83	Monitor the southwestern boundary of the plume	A	Explosives	A	Explosives
MW-524M1	6.32	to	-3.68	Monitor near core of plume	S	Explosives	S	Explosives
MW-525M1	-19.61	to	-29.61	Monitor the leading edge of the plume	S	Explosives	**A**	Explosives
MW-525M2	4.39	to	-5.61	Monitor the leading edge of the plume	S	Explosives	**A**	Explosives
MW-526M1	-11.28	to	-21.28	Monitor the leading edge of the plume	S	Explosives	**A**	Explosives
MW-527M1	-13.38	to	-23.38	Monitor the leading edge of the plume	S	Explosives	**A**	Explosives
MW-528M1	39.68	to	29.68	Monitor downgradient of source area along plume core	S	Explosives	**A**	Explosives

Notes:

J-1 = J-1 Range

J-1 S = J-1 Southern

ft = feet

m = meters
msl = mean sea level
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine
HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
SVOC = semi-volatile organic compound
VOC = volatile organic compound

(a)

A = annually

S = semiannually

BE = biennially

(b)
Explosives = EPA Method SW846/8330
Perchlorate = EPA Method E314.0 or SW6850

Yellow shading denotes changes to sample program

APPENDIX A

APPENDIX A

J-1 Range Southern
Capture Zone Analysis
2011 Annual Report

Input Required	Units	10/24/2011 Values	11/8/2010 Values
Well - J1SEW0001			
Aquifer or Screen Thickness (b)	**ft**	93.5	95
Hydraulic Conductivity (K)	**ft/day**	200	200
Hydraulic Gradient (I)	**ft/ft**	0.00040	0.00040
Transmissivity (K*b)	**sq ft./day**	18700	19000
Flow Rate (Q)	**gpm**	45	45
Flow Rate (Q)	**cubic feet/day**	8663.10	8663.10
1/2 - Capture Width @ Well	**ft**	290	285
Ywell = ±Q/4Ti			
Full Capture Width @ Well	ft	579	570
Ywell = Q/2Ti			
1/2 - Max Capture Width Upgradient of Well	ft	579	570
Ymax = ±Q/2Ti			
Full Max Capture Width Upgradient of Well	ft	1158	1140
Ymax = Q/Ti			
Stagnation Point	ft	184	181
Xo = -Q/2πTi			

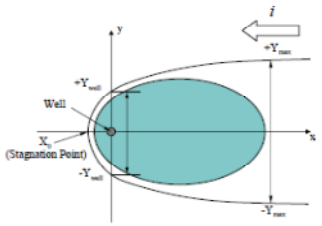
Capture Zone Envelope Shape for 10/24/2011

X	Y
-184	1
-166	100
-106	200
17	300
119	350
273	400
384	425
534	450
699	470
1093	500
1738	525
2914	545
-184	-1
-166	-100
-106	-200
17	-300
119	-350
273	-400
384	-425
534	-450
699	-470
1093	-500
1738	-525
2914	-545

Capture Zone Width Calculation, One Extraction Well

Assumptions:

- homogeneous, isotropic, confined aquifer of infinite extent
- uniform aquifer thickness
- fully penetrating extraction well(s)
- uniform regional horizontal hydraulic gradient
- steady-state flow
- negligible vertical gradient
- no net recharge, or net recharge is accounted for in regional hydraulic gradient
- no other sources of water introduced to aquifer due to extraction (e.g., from rivers or leakage from above or below)



$$x = \frac{-y}{\tan\left(\frac{2\pi Ti}{Q}y\right)} \quad -or- \quad y = \pm\left(\frac{Q}{2Ti}\right) - \left(\frac{Q}{2\pi Ti}\right)\tan^{-1}\left(\frac{y}{x}\right)$$

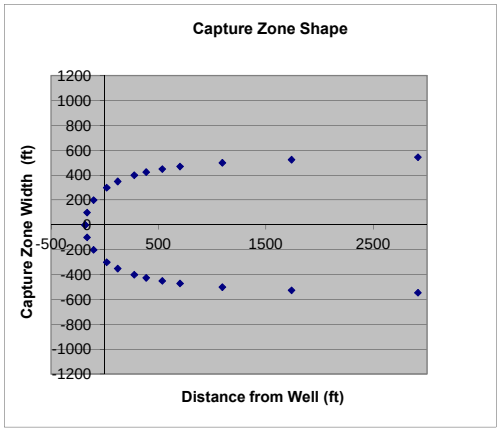
$$X_0 = -Q/2\pi Ti \quad ; \quad Y_{max} = \pm Q/2Ti \quad ; \quad Y_{well} = \pm Q/4Ti$$

(must use consistent units, such as "ft" for distance and "day" for time)

Where:

- Q = extraction rate
- T = transmissivity, $K \cdot b$
- K = hydraulic conductivity
- b = saturated thickness
- i = regional (i.e., pre-remedy-pumping) hydraulic gradient
- X_0 = distance from the well to the downgradient end of the capture zone along the central line of the flow direction
- Y_{max} = maximum capture zone width from the central line of the plume
- Y_{well} = capture zone width at the location of well from the central line of the plume

The above equation is used to calculate the outline of the capture zone. Solving the equation for $x = 0$ allows one to calculate the distance between the dividing streamlines at the line of wells ($2 \cdot Y_{well}$) and solving the equation for $x = \infty$ allows one to calculate the distance between the dividing streamlines far upstream from the wells ($2 \cdot Y_{max}$). One can also calculate the distance from the well to the stagnation point (X_0) that marks the downgradient end of the capture zone by solving for x at $y = 0$. For any value of y between 0 and Y_{max}, one can calculate the corresponding x value, allowing the outline of the capture zone to be calculated.



Source:

EPA United States Environmental Protection Agency

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APPENDIX B

Appendix B
J-1 Range Southern RDX Results
Inception through 2011

Well ID	Sample Type	Test Method	RDX Result (ug/L)	Qualifier	MDL (ug/L)	RL (ug/L)	Log Date
DP-379	N1	SW8330	ND	U	ND	ND	10/25/2011
DP-379	N1	SW8330	ND	U	ND	ND	12/02/2010
DP-379	N1	SW8330	ND	U	ND	ND	11/03/2009
DP-389	N1	SW8330	ND	U	ND	ND	10/26/2011
DP-389	N1	SW8330	0.16	J	0.036	0.22	12/02/2010
DP-389	N1	SW8330	0.64		0.034	0.20	11/04/2009
MW-131S	N1	SW8330	ND	UJ	ND	ND	10/27/2011
MW-131S	N1	SW8330	ND	U	ND	ND	11/30/2010
MW-131S	N1	SW8330	ND	UJ	ND	ND	11/30/2010
MW-131S	N1	SW8330	ND	U	ND	ND	10/30/2009
MW-131S	N1	SW8330	ND	UJ	ND	ND	10/30/2009
MW-131S	N1	SW8330	ND	U	ND	ND	10/21/2008
MW-131S	N1	SW8330	ND	U	ND	ND	08/01/2008
MW-131S	N1	SW8330	ND	U	ND	ND	09/10/2005
MW-131S	N2	SW8330	ND	U	ND	ND	08/30/2004
MW-131S	N2	SW8330	ND	UJ	ND	ND	08/30/2004
MW-131S	FD2	SW8330	ND	U	ND	ND	08/30/2004
MW-131S	FD2	SW8330	ND	UJ	ND	ND	08/30/2004
MW-131S	N2	SW8330	ND	U	ND	ND	12/19/2003
MW-131S	N2	SW8330	ND	U	ND	ND	09/11/2003
MW-131S	N2	SW8330	ND	U	ND	ND	12/06/2002
MW-131S	N1	SW8330	ND	U	ND	ND	08/26/2002
MW-131S	N1	SW8330	ND	U	ND	ND	12/13/2001
MW-131S	FD1	SW8330	ND	U	ND	ND	12/13/2001
MW-131S	N1	SW8330	ND	U	ND	ND	06/11/2001
MW-131S	N1	SW8330	ND	U	ND	ND	02/20/2001
MW-131S	N1	SW8330	ND	UJ	ND	ND	11/06/2000
MW-360M2	N1	SW8330	0.25	J	0.034	0.21	11/01/2011
MW-360M2	FD1	SW8330	0.25	J	0.034	0.21	11/01/2011
MW-360M2	N1	SW8330	2.3		0.034	0.21	05/05/2011
MW-360M2	N1	SW8330	6.1		0.034	0.20	11/12/2010
MW-360M2	FD1	SW8330	6.1		0.034	0.21	11/12/2010
MW-360M2	N1	SW8330	9.0		0.17	1.0	04/29/2010
MW-360M2	N1	SW8330	0.34	J	0.034	0.21	10/30/2009
MW-360M2	FD1	SW8330	0.38		0.034	0.20	10/30/2009
MW-360M2	N1	SW8330	0.70		0.037	0.22	05/11/2009
MW-360M2	N1	SW8330	ND	UJ	ND	ND	10/21/2008
MW-360M2	N1	SW8330	0.66		0.056	0.25	08/01/2008
MW-360M2	N1	SW8330	ND	UJ	ND	ND	04/07/2008
MW-360M2	N1	SW8330	1.6		0.094	0.25	11/29/2005
MW-360M2	N1	SW8330	3.4		0.032	0.25	07/25/2005
MW-360M2	N1	SW8330	ND	U	ND	ND	03/17/2005
MW-398M1	N1	SW8330	ND	U	ND	ND	11/01/2011
MW-398M1	N1	SW8330	ND	UJ	ND	ND	11/01/2011
MW-398M1	N1	SW8330	ND	U	ND	ND	11/30/2010
MW-398M1	N1	SW8330	ND	UJ	ND	ND	11/30/2010
MW-398M1	N1	SW8330	ND	U	ND	ND	10/29/2009
MW-398M1	N1	SW8330	ND	UJ	ND	ND	10/29/2009
MW-398M1	N1	SW8330	ND	U	ND	ND	10/21/2008
MW-398M1	N1	SW8330	ND	U	ND	ND	08/01/2008
MW-398M1	N1	SW8330	ND	U	ND	ND	08/09/2007
MW-398M1	N1	SW8330	ND	U	ND	ND	02/01/2007

Appendix B
J-1 Range Southern RDX Results
Inception through 2011

Well ID	Sample Type	Test Method	RDX Result (ug/L)	Qualifier	MDL (ug/L)	RL (ug/L)	Log Date
MW-398M1	N1	SW8330	ND	U	ND	ND	06/16/2006
MW-398M1	N1	SW8330	ND	U	ND	ND	02/16/2006
MW-398M1	N1	SW8330	ND	U	ND	ND	10/19/2005
MW-398M2	N1	SW8330	ND	U	ND	ND	11/01/2011
MW-398M2	N1	SW8330	ND	UJ	ND	ND	11/01/2011
MW-398M2	N1	SW8330	ND	U	ND	ND	11/30/2010
MW-398M2	N1	SW8330	ND	UJ	ND	ND	11/30/2010
MW-398M2	N1	SW8330	ND	U	ND	ND	10/29/2009
MW-398M2	N1	SW8330	ND	UJ	ND	ND	10/29/2009
MW-398M2	N1	SW8330	ND	UJ	ND	ND	10/21/2008
MW-398M2	N1	SW8330	ND	U	ND	ND	08/01/2008
MW-398M2	FD1	SW8330	ND	U	ND	ND	08/01/2008
MW-398M2	N1	SW8330	26.0		0.11	0.50	08/09/2007
MW-398M2	FD1	SW8330	26.0		0.11	0.50	08/09/2007
MW-398M2	N1	SW8330	34.0		0.11	0.50	02/01/2007
MW-398M2	N1	SW8330	100		0.94	2.5	06/16/2006
MW-398M2	N1	SW8330	130		0.75	2.0	02/16/2006
MW-398M2	FD1	SW8330	120		0.75	2.0	02/16/2006
MW-398M2	N1	SW8330	120		0.94	2.5	10/19/2005
MW-398M2	FD1	SW8330	120		0.94	2.5	10/19/2005
MW-400M1	N1	SW8330	ND	UJ	ND	ND	11/02/2011
MW-400M1	N1	SW8330	ND	UJ	ND	ND	12/01/2010
MW-400M1	N1	SW8330	ND	U	ND	ND	11/02/2009
MW-400M1	N1	SW8330	ND	UJ	ND	ND	11/02/2009
MW-400M1	N1	SW8330	ND	U	ND	ND	10/20/2008
MW-400M1	N1	SW8330	ND	U	ND	ND	07/30/2008
MW-400M1	N1	SW8330	ND	U	ND	ND	08/07/2007
MW-400M1	N1	SW8330	ND	U	ND	ND	01/29/2007
MW-400M1	N1	SW8330	ND	U	ND	ND	06/28/2006
MW-400M1	N1	SW8330	ND	U	ND	ND	02/27/2006
MW-400M1	N1	SW8330	ND	U	ND	ND	10/31/2005
MW-400M2	N1	SW8330	ND	U	ND	ND	11/02/2011
MW-400M2	N1	SW8330	ND	UJ	ND	ND	11/02/2011
MW-400M2	N1	SW8330	ND	U	ND	ND	12/01/2010
MW-400M2	N1	SW8330	ND	UJ	ND	ND	12/01/2010
MW-400M2	N1	SW8330	ND	U	ND	ND	04/29/2010
MW-400M2	N1	SW8330	ND	UJ	ND	ND	04/29/2010
MW-400M2	N1	SW8330	ND	U	ND	ND	11/03/2009
MW-400M2	N1	SW8330	ND	UJ	ND	ND	11/03/2009
MW-400M2	N1	SW8330	ND	U	ND	ND	05/12/2009
MW-400M2	N1	SW8330	ND	UJ	ND	ND	05/12/2009
MW-400M2	N1	SW8330	ND	U	ND	ND	10/20/2008
MW-400M2	N1	SW8330	ND	U	ND	ND	07/30/2008
MW-400M2	N1	SW8330	ND	U	ND	ND	04/07/2008
MW-400M2	N1	SW8330	ND	U	ND	ND	08/07/2007
MW-400M2	N1	SW8330	ND	U	ND	ND	01/29/2007
MW-400M2	N1	SW8330	ND	U	ND	ND	06/28/2006
MW-400M2	N1	SW8330	ND	U	ND	ND	02/27/2006
MW-400M2	N1	SW8330	ND	U	ND	ND	10/31/2005
MW-402M1	N1	SW8330	ND	U	ND	ND	11/03/2011
MW-402M1	N1	SW8330	ND	UJ	ND	ND	11/03/2011
MW-402M1	N1	SW8330	ND	U	ND	ND	11/30/2010

Appendix B
J-1 Range Southern RDX Results
Inception through 2011

Well ID	Sample Type	Test Method	RDX Result (ug/L)	Qualifier	MDL (ug/L)	RL (ug/L)	Log Date
MW-402M1	N1	SW8330	ND	UJ	ND	ND	11/30/2010
MW-402M1	N1	SW8330	ND	U	ND	ND	11/02/2009
MW-402M1	N1	SW8330	ND	UJ	ND	ND	11/02/2009
MW-402M1	N1	SW8330	ND	UJ	ND	ND	10/20/2008
MW-402M1	N1	SW8330	ND	U	ND	ND	07/30/2008
MW-402M1	N1	SW8330	ND	U	ND	ND	08/07/2007
MW-402M1	N1	SW8330	ND	U	ND	ND	01/29/2007
MW-402M1	N1	SW8330	ND	U	ND	ND	09/22/2006
MW-402M1	N1	SW8330	ND	U	ND	ND	05/25/2006
MW-402M1	N1	SW8330	ND	U	ND	ND	01/27/2006
MW-402M2	N1	SW8330	ND	U	ND	ND	11/03/2011
MW-402M2	N1	SW8330	ND	UJ	ND	ND	11/03/2011
MW-402M2	N1	SW8330	ND	U	ND	ND	05/04/2011
MW-402M2	N1	SW8330	ND	UJ	ND	ND	05/04/2011
MW-402M2	N1	SW8330	ND	U	ND	ND	12/01/2010
MW-402M2	N1	SW8330	0.49		0.033	0.20	04/29/2010
MW-402M2	N1	SW8330	0.52		0.035	0.21	11/02/2009
MW-402M2	N1	SW8330	0.93		0.038	0.23	05/12/2009
MW-402M2	FD1	SW8330	0.79		0.035	0.21	05/12/2009
MW-402M2	N1	SW8330	1.1		0.093	0.21	10/20/2008
MW-402M2	FD1	SW8330	1.1		0.093	0.21	10/20/2008
MW-402M2	N1	SW8330	1.0		0.017	0.25	07/30/2008
MW-402M2	FD1	SW8330	1.0		0.017	0.25	07/30/2008
MW-402M2	N1	SW8330	0.34		0.097	0.22	04/07/2008
MW-402M2	N1	SW8330	ND	U	ND	ND	08/07/2007
MW-402M2	N1	SW8330	ND	U	ND	ND	01/29/2007
MW-402M2	N1	SW8330	ND	U	ND	ND	09/22/2006
MW-402M2	FD1	SW8330	ND	U	ND	ND	09/22/2006
MW-402M2	N1	SW8330	ND	U	ND	ND	05/25/2006
MW-402M2	N1	SW8330	ND	U	ND	ND	01/27/2006
MW-403M1	N1	SW8330	0.47		0.037	0.23	11/01/2011
MW-403M1	N1	SW8330	ND	U	ND	ND	11/10/2010
MW-403M1	N1	SW8330	ND	UJ	ND	ND	11/10/2010
MW-403M1	N1	SW8330	ND	U	ND	ND	04/29/2010
MW-403M1	N1	SW8330	ND	UJ	ND	ND	04/29/2010
MW-403M1	N1	SW8330	ND	U	ND	ND	10/30/2009
MW-403M1	N1	SW8330	ND	UJ	ND	ND	10/30/2009
MW-403M1	N1	SW8330	ND	U	ND	ND	05/12/2009
MW-403M1	N1	SW8330	ND	UJ	ND	ND	05/12/2009
MW-403M1	N1	SW8330	ND	U	ND	ND	10/17/2008
MW-403M1	N1	SW8330	ND	U	ND	ND	07/31/2008
MW-403M1	N1	SW8330	ND	U	ND	ND	04/07/2008
MW-403M1	N1	SW8330	ND	U	ND	ND	08/09/2007
MW-403M1	N1	SW8330	ND	U	ND	ND	01/31/2007
MW-403M1	N1	SW8330	ND	U	ND	ND	07/21/2006
MW-403M1	N1	SW8330	ND	U	ND	ND	03/21/2006
MW-403M1	N1	SW8330	ND	U	ND	ND	11/21/2005
MW-403M2	N1	SW8330	ND	UJ	ND	ND	11/01/2011
MW-403M2	N1	SW8330	ND	U	ND	ND	11/10/2010
MW-403M2	N1	SW8330	ND	UJ	ND	ND	11/10/2010
MW-403M2	N1	SW8330	ND	U	ND	ND	10/30/2009
MW-403M2	N1	SW8330	ND	UJ	ND	ND	10/30/2009
MW-403M2	N1	SW8330	ND	U	ND	ND	10/17/2008

Appendix B
J-1 Range Southern RDX Results
Inception through 2011

Well ID	Sample Type	Test Method	RDX Result (ug/L)	Qualifier	MDL (ug/L)	RL (ug/L)	Log Date
MW-403M2	N1	SW8330	ND	U	ND	ND	07/31/2008
MW-403M2	N1	SW8330	ND	U	ND	ND	08/09/2007
MW-403M2	N1	SW8330	ND	U	ND	ND	01/31/2007
MW-403M2	N1	SW8330	ND	U	ND	ND	07/21/2006
MW-403M2	N1	SW8330	ND	U	ND	ND	03/21/2006
MW-403M2	N1	SW8330	ND	U	ND	ND	11/21/2005
MW-480M2	N1	SW8330	ND	U	ND	ND	11/03/2011
MW-480M2	N1	SW8330	ND	UJ	ND	ND	11/03/2011
MW-480M2	N1	SW8330	ND	U	ND	ND	11/12/2010
MW-480M2	N1	SW8330	ND	UJ	ND	ND	11/12/2010
MW-480M2	N1	SW8330	ND	U	ND	ND	04/29/2010
MW-480M2	N1	SW8330	ND	UJ	ND	ND	04/29/2010
MW-480M2	N1	SW8330	ND	U	ND	ND	10/30/2009
MW-480M2	N1	SW8330	ND	UJ	ND	ND	10/30/2009
MW-480M2	N1	SW8330	ND	U	ND	ND	05/12/2009
MW-480M2	N1	SW8330	ND	UJ	ND	ND	05/12/2009
MW-480M2	N1	SW8330	ND	UJ	ND	ND	10/20/2008
MW-480M2	N1	SW8330	0.37		0.056	0.25	07/30/2008
MW-480M2	N1	SW8330	0.42		0.096	0.22	04/07/2008
MW-480M2	N1	SW8330	0.88		0.053	0.25	10/26/2007
MW-480M2	N1	SW8330	0.87		0.053	0.25	07/02/2007
MW-480M2	N1	SW8330	0.81		0.053	0.25	03/07/2007
MW-481M1	N1	SW8330	ND	U	ND	ND	11/02/2011
MW-481M1	N1	SW8330	ND	UJ	ND	ND	11/02/2011
MW-481M1	N1	SW8330	ND	U	ND	ND	11/10/2010
MW-481M1	N1	SW8330	ND	UJ	ND	ND	11/10/2010
MW-481M1	N1	SW8330	ND	U	ND	ND	04/29/2010
MW-481M1	N1	SW8330	ND	UJ	ND	ND	04/29/2010
MW-481M1	N1	SW8330	ND	U	ND	ND	10/29/2009
MW-481M1	N1	SW8330	ND	UJ	ND	ND	10/29/2009
MW-481M1	N1	SW8330	ND	R	ND	ND	05/13/2009
MW-481M1	N1	SW8330	ND	UJ	ND	ND	10/17/2008
MW-481M1	N1	SW8330	ND	U	ND	ND	07/31/2008
MW-481M1	N1	SW8330	ND	U	ND	ND	04/04/2008
MW-481M1	N1	SW8330	ND	U	ND	ND	10/26/2007
MW-481M1	N1	SW8330	ND	U	ND	ND	06/28/2007
MW-481M1	N1	SW8330	ND	U	ND	ND	02/27/2007
MW-481M2	N1	SW8330	ND	U	ND	ND	11/02/2011
MW-481M2	N1	SW8330	0.25		0.035	0.21	05/03/2011
MW-481M2	N1	SW8330	2.1		0.034	0.21	11/10/2010
MW-481M2	N1	SW8330	0.82		0.035	0.21	04/29/2010
MW-481M2	FD1	SW8330	0.80		0.034	0.20	04/29/2010
MW-481M2	N1	SW8330	4.8		0.033	0.20	10/27/2009
MW-481M2	FD1	SW8330	3.6		0.033	0.20	10/27/2009
MW-481M2	N1	SW8330	4.7		0.038	0.25	10/27/2009
MW-481M2	N1	SW8330	20.0		0.18	1.1	05/13/2009
MW-481M2	FD1	SW8330	20.3		0.18	1.1	05/13/2009
MW-481M2	N1	SW8330	14.8	J	0.47	1.1	10/17/2008
MW-481M2	FD1	SW8330	14.9	J	0.46	1.1	10/17/2008
MW-481M2	N1	SW8330	4.2		0.056	0.25	07/31/2008
MW-481M2	N1	SW8330	7.9		0.096	0.22	04/04/2008
MW-481M2	FD1	SW8330	8.1		0.096	0.22	04/04/2008
MW-481M2	N1	SW8330	12.0		0.053	0.25	10/26/2007

Appendix B
J-1 Range Southern RDX Results
Inception through 2011

Well ID	Sample Type	Test Method	RDX Result (ug/L)	Qualifier	MDL (ug/L)	RL (ug/L)	Log Date
MW-481M2	FD1	SW8330	12.0		0.053	0.25	10/26/2007
MW-481M2	N1	SW8330	22.0		0.11	0.50	06/28/2007
MW-481M2	FD1	SW8330	22.0		0.11	0.50	06/28/2007
MW-481M2	N1	SW8330	12.0		0.053	0.25	02/27/2007
MW-481M2	FD1	SW8330	12.0		0.053	0.25	02/27/2007
MW-482M2	N1	SW8330	1.7		0.037	0.23	11/02/2011
MW-482M2	N1	SW8330	1.0		0.037	0.22	05/03/2011
MW-482M2	N1	SW8330	0.74		0.034	0.20	11/12/2010
MW-482M2	N1	SW8330	1.0		0.034	0.20	04/29/2010
MW-482M2	N1	SW8330	0.44		0.034	0.21	10/29/2009
MW-482M2	N1	SW8330	0.74		0.035	0.21	05/13/2009
MW-482M2	N1	SW8330	1.0		0.094	0.21	10/17/2008
MW-482M2	N1	SW8330	0.81		0.056	0.25	08/04/2008
MW-482M2	N1	SW8330	ND	U	ND	ND	04/04/2008
MW-482M2	N1	SW8330	0.48		0.053	0.25	11/06/2007
MW-482M2	N1	SW8330	0.39		0.053	0.25	07/09/2007
MW-482M2	N1	SW8330	0.28		0.053	0.25	03/19/2007
MW-482M3	N1	SW8330	ND	U	ND	ND	11/02/2011
MW-482M3	N1	SW8330	ND	UJ	ND	ND	11/02/2011
MW-482M3	N1	SW8330	ND	U	ND	ND	11/12/2010
MW-482M3	N1	SW8330	ND	UJ	ND	ND	11/12/2010
MW-482M3	N1	SW8330	ND	U	ND	ND	10/30/2009
MW-482M3	N1	SW8330	ND	UJ	ND	ND	10/30/2009
MW-482M3	N1	SW8330	ND	U	ND	ND	10/17/2008
MW-482M3	N1	SW8330	ND	U	ND	ND	08/04/2008
MW-482M3	N1	SW8330	ND	U	ND	ND	11/06/2007
MW-482M3	N1	SW8330	ND	U	ND	ND	07/09/2007
MW-482M3	N1	SW8330	ND	U	ND	ND	03/16/2007
MW-483M1	N1	SW8330	ND	U	ND	ND	10/27/2011
MW-483M1	N1	SW8330	ND	UJ	ND	ND	10/27/2011
MW-483M1	N1	SW8330	ND	U	ND	ND	11/30/2010
MW-483M1	N1	SW8330	ND	U	ND	ND	04/30/2010
MW-483M1	N1	SW8330	ND	UJ	ND	ND	04/30/2010
MW-483M1	N1	SW8330	ND	U	ND	ND	11/02/2009
MW-483M1	N1	SW8330	ND	UJ	ND	ND	11/02/2009
MW-483M1	N1	SW8330	ND	U	ND	ND	05/12/2009
MW-483M1	N1	SW8330	ND	UJ	ND	ND	05/12/2009
MW-483M1	N1	SW8330	ND	UJ	ND	ND	10/22/2008
MW-483M1	N1	SW8330	ND	U	ND	ND	07/31/2008
MW-483M1	N1	SW8330	ND	U	ND	ND	04/08/2008
MW-483M1	N1	SW8330	ND	UJ	ND	ND	04/08/2008
MW-483M1	N1	SW8330	ND	U	ND	ND	11/15/2007
MW-483M1	N1	SW8330	0.71		0.053	0.25	07/03/2007
MW-483M1	N1	SW8330	ND	U	ND	ND	07/03/2007
MW-483M1	N1	SW8330	ND	U	ND	ND	03/08/2007
MW-488M1	N1	SW8330	ND	U	ND	ND	10/26/2011
MW-488M1	N1	SW8330	ND	UJ	ND	ND	10/26/2011
MW-488M1	N1	SW8330	ND	U	ND	ND	11/30/2010
MW-488M1	N1	SW8330	ND	U	ND	ND	04/30/2010
MW-488M1	N1	SW8330	ND	UJ	ND	ND	04/30/2010
MW-488M1	N1	SW8330	ND	U	ND	ND	11/02/2009
MW-488M1	N1	SW8330	ND	UJ	ND	ND	11/02/2009

Appendix B
J-1 Range Southern RDX Results
Inception through 2011

Well ID	Sample Type	Test Method	RDX Result (ug/L)	Qualifier	MDL (ug/L)	RL (ug/L)	Log Date
MW-488M1	N1	SW8330	ND	U	ND	ND	05/13/2009
MW-488M1	N1	SW8330	ND	UJ	ND	ND	05/13/2009
MW-488M1	N1	SW8330	ND	U	ND	ND	10/22/2008
MW-488M1	N1	SW8330	ND	U	ND	ND	08/05/2008
MW-488M1	N1	SW8330	ND	U	ND	ND	04/08/2008
MW-488M1	N1	SW8330	ND	UJ	ND	ND	04/08/2008
MW-488M1	N1	SW8330	ND	U	ND	ND	01/10/2008
MW-488M1	FD1	SW8330	ND	U	ND	ND	01/10/2008
MW-488M1	N1	SW8330	0.25		0.053	0.25	09/07/2007
MW-488M1	N1	SW8330	ND	U	ND	ND	09/07/2007
MW-488M1	N1	SW8330	ND	U	ND	ND	05/07/2007
MW-488PZ	N1	SW8330	2.7		0.036	0.22	10/25/2011
MW-488PZ	N1	SW8330	0.98		0.036	0.22	12/02/2010
MW-488PZ	N1	SW8330	ND	U	ND	ND	04/30/2010
MW-488PZ	N1	SW8330	ND	UJ	ND	ND	04/30/2010
MW-488PZ	N1	SW8330	ND	U	ND	ND	11/03/2009
MW-488PZ	N1	SW8330	ND	UJ	ND	ND	11/03/2009
MW-488PZ	N1	SW8330	ND	U	ND	ND	05/13/2009
MW-488PZ	N1	SW8330	ND	UJ	ND	ND	05/13/2009
MW-488PZ	N1	SW8330	ND	U	ND	ND	10/22/2008
MW-488PZ	N1	SW8330	ND	U	ND	ND	08/05/2008
MW-488PZ	N1	SW8330	ND	U	ND	ND	04/08/2008
MW-488PZ	N1	SW8330	ND	UJ	ND	ND	04/08/2008
MW-521M1	N1	SW8330	ND	U	ND	ND	11/07/2011
MW-521M1	N1	SW8330	ND	U	ND	ND	12/06/2010
MW-521M1	N1	SW8330	0.57		0.032	0.20	01/07/2010
MW-522M1	N1	SW8330	ND	U	ND	ND	11/07/2011
MW-522M1	N1	SW8330	0.22		0.035	0.21	05/05/2011
MW-522M1	N1	SW8330	ND	U	ND	ND	12/06/2010
MW-522M1	N1	SW8330	ND	U	ND	ND	01/20/2010
MW-522M2	N1	SW8330	1.4		0.023	0.20	11/07/2011
MW-522M2	FD1	SW8330	1.4		0.023	0.20	11/07/2011
MW-522M2	N1	SW8330	1.4		0.035	0.21	05/05/2011
MW-522M2	N1	SW8330	1.6		0.037	0.20	12/06/2010
MW-522M2	N1	SW8330	2.4		0.037	0.20	01/20/2010
MW-523M1	N1	SW8330	ND	U	ND	ND	11/07/2011
MW-523M1	N1	SW8330	ND	U	ND	ND	12/06/2010
MW-523M1	N1	SW8330	ND	U	ND	ND	01/07/2010
MW-524M1	N1	SW8330	55.7		0.092	0.80	11/08/2011
MW-524M1	FD1	SW8330	54.6		0.092	0.80	11/08/2011
MW-524M1	N1	SW8330	76.1		0.72	4.4	05/04/2011
MW-524M1	FD1	SW8330	73.8		0.70	4.2	05/04/2011
MW-524M1	N1	SW8330	53.5		0.15	0.80	12/06/2010
MW-524M1	FD1	SW8330	52.7		0.15	0.80	12/06/2010
MW-524M1	N1	SW8330	12.0		0.037	0.20	02/04/2010
MW-524M1	N1	SW8330	11.0		0.037	0.20	01/21/2010
MW-525M1	N1	SW8330	ND	U	ND	ND	11/07/2011
MW-525M1	N1	SW8330	ND	U	ND	ND	05/04/2011
MW-525M1	N1	SW8330	ND	UJ	ND	ND	05/04/2011

Appendix B
J-1 Range Southern RDX Results
Inception through 2011

Well ID	Sample Type	Test Method	RDX Result (ug/L)	Qualifier	MDL (ug/L)	RL (ug/L)	Log Date
MW-525M1	N1	SW8330	ND	U	ND	ND	12/07/2010
MW-525M1	N1	SW8330	ND	U	ND	ND	01/21/2010
MW-525M2	N1	SW8330	ND	U	ND	ND	11/07/2011
MW-525M2	N1	SW8330	ND	U	ND	ND	05/04/2011
MW-525M2	N1	SW8330	ND	UJ	ND	ND	05/04/2011
MW-525M2	N1	SW8330	ND	U	ND	ND	12/07/2010
MW-525M2	N1	SW8330	ND	U	ND	ND	01/21/2010
MW-526M1	N1	SW8330	ND	U	ND	ND	11/08/2011
MW-526M1	N1	SW8330	ND	U	ND	ND	05/04/2011
MW-526M1	N1	SW8330	ND	UJ	ND	ND	05/04/2011
MW-526M1	N1	SW8330	ND	U	ND	ND	12/07/2010
MW-526M1	N1	SW8330	ND	UJ	ND	ND	12/07/2010
MW-526M1	N1	SW8330	ND	U	ND	ND	01/21/2010
MW-527M1	N1	SW8330	ND	U	ND	ND	11/08/2011
MW-527M1	N1	SW8330	ND	U	ND	ND	05/04/2011
MW-527M1	N1	SW8330	ND	UJ	ND	ND	05/04/2011
MW-527M1	N1	SW8330	ND	U	ND	ND	12/06/2010
MW-527M1	N1	SW8330	ND	U	ND	ND	01/26/2010
MW-528M1	N1	SW8330	0.41		0.023	0.20	11/08/2011
MW-528M1	N1	SW8330	1.2		0.035	0.21	05/05/2011
MW-528M1	N1	SW8330	2.8		0.037	0.20	12/07/2010
MW-528M1	FD1	SW8330	2.8		0.037	0.20	12/07/2010
MW-528M1	N1	SW8330	4.6		0.037	0.20	01/21/2010

Notes:

RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine
µg/L - micrograms per liter
MDL - method detection limit
RL - reporting limit
ND - not detected

N1 - primary field sample
FD1/FD2 - field duplicate sample
U - not detected
J - estimated concentration

APPENDIX C

Project Note- Changes to J-1 Range Northern and Southern Chemical and Hydraulic Monitoring Well Networks

PROJECT NOTE

Client, Project and Location:
Impact Area Groundwater Study Program
J-1 Range Northern and Southern Sites
Camp Edwards, MA

Subject: Changes to J-1 Range Northern and Southern Chemical and Hydraulic Monitoring Well Networks

Date: November 7, 2012

PURPOSE

On September 12, 2012, the U.S. Army National Guard's Impact Area Groundwater Study Program (IAGWSP), submitted response to comments on the Draft J-1 Range Northern 2011 and J-1 Southern Annual 2011 Environmental Monitoring Report, dated June 2012. Comments were received from U.S. Environmental Protection Agency and from the Massachusetts Department of Environmental Protection (MassDEP) in letters dated August 1, 2012, and July 18, 2012, respectively. MassDEP approved the RCL in a letter dated September 20, 2012.

EPA offered an additional comment (re-survey of monitoring wells in 2012, at specified locations for J-1 Range Southern Range) for conditional approval of the RCL by e-mail on October 11, 2012. IAGWSP confirmed acceptance the additional comment via e-mail on October 16, 2012 as the Memorandum of Resolution (MOR). This Project Note (PN) documents agency concurrence with the changes to the chemical and hydraulic monitoring network described in the draft report, RCL, and MOR. The attached tables show the approved chemical and hydraulic monitoring networks.

CONCURRENCE

Concurrence with the agreements presented in this project note are represented by the signatures below:

Jane Nolan 11-20-12
USEPA Representative

12/6/12
MassDEP Representative

IAGWSP Representative

Distribution: L. Jennings and J. Dolan (EPA); L. Pinaud and M. Panni (MassDEP); B. Gregson, D. Hill, and P. Richardson (IAGWSP); C. Kilbridge, J. Ehret, G. Kaso, M. Anderson, and M. Wojtas (USACE).

Table 1
J-1 Range Northern Interim Groundwater Chemical Monitoring Network- November 2012

Location	Screen Interval (ft msl)	Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Parameters (b)
MW-136S	70.88 to 60.88	Monitor the trailing edge and source of the RDX and HMX plumes.	A	Explosives	A	Explosives
MW-164M1	-46.68 to -56.68	Monitor the lower eastern boundary of the RDX and HMX plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-164M2	23.32 to 13.32	Monitor adjacent to the core of the RDX and HMX plumes.	A	Explosives	A	Explosives
MW-166M1	-40.07 to -45.07	Monitor the lower boundary of the RDX plume.	A	Explosives	A	Explosives
MW-166M2	27.93 to 17.93	Monitor the core of the RDX and HMX plumes.	A	Explosives	A	Explosives
MW-166M3	52.93 to 42.93	Monitor the upper boundary of the RDX, HMX, and perchlorate plumes.	**A**	**Explosives, Perchlorate**	**A**	**Explosives**
MW-168M2	-43.86 to -53.86	Monitor the lower western boundary of the RDX and perchlorate plumes to confirm flow path from source area.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-168M3	51.14 to 41.14	Monitor the western boundary of the RDX and HMX plumes to confirm flow path from the source area.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-187D	-131.54 to -141.54	Benzene and other fuel-related constituents have historically exceeded their respective MCLs.	A	VOCs, SVOCs	A	VOCs, SVOCs
MW-187M1	14.46 to 4.46	Monitor the western boundary of the RDX and HMX plumes.	A	Explosives	A	Explosives
MW-188M1	24.41 to 14.41	Monitor the eastern boundary of the RDX and HMX plumes.	A	Explosives	A	Explosives
MW-191M2	59.62 to 49.62	Monitor the trailing edge and source of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-205M1	-4.24 to -14.24	Monitor the most downgradient RDX detection.	A	Explosives	**NA**	Explosives
MW-220M1	-55.85 to -65.85	Monitor the western boundary of the RDX and perchlorate plumes.	**S**	**Explosives, Perchlorate**	**A**	**Explosives, Perchlorate**
MW-253M1	-72.04 to -82.04	Monitor the western/leading edge of the RDX and perchlorate plumes.	**S**	**Explosives, Perchlorate**	**A**	**Explosives, Perchlorate**
MW-265M1	-72.77 to -82.77	Monitor the lower boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-265M2	-32.77 to -42.77	Monitor the core of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate

Table 1
J-1 Range Northern Interim Groundwater Chemical Monitoring Network- November 2012

Location	Screen Interval (ft msl)	Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Parameters (b)
MW-265M3	-7.77 to -17.77	Monitor the upper boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-286M1	-63 to -73	Monitor the lower boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-286M2	-9 to -19	Monitor the leading edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-303M1	-118.28 to -128.28	Monitor the lower boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-303M2	-54.3 to -64.31	Monitor the core of the RDX, HMX, and perchlorate plumes to understand the dynamics of the higher concentrations	S	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-303M3	41.05 to 31.1	Monitor the core of the RDX, HMX, and perchlorate plumes to understand the dynamics of the higher concentrations	S	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-306D	-105.99 to -115.99	Benzene and other fuel-related constituents have historically exceeded their respective MCLs.	A	VOCs, SVOCs	A	VOCs, SVOCs
MW-306M1	0.79 to -9.21	Monitor the western boundary of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-306M2	20.98 to 10.98	Monitor the western boundary of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-315M1	-55.27 to -65.27	Monitor the western edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-315M2	-4.78 to -14.78	Monitor the western edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-326M1	-63.66 to -73.66	Monitor the lower boundary of the RDX and perchlorate plumes to confirm plume extent.	**S**	**Explosives, Perchlorate**	**A**	**Explosives, Perchlorate**
MW-326M2	-9.92 to -19.93	Monitor the core of the RDX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-326M3	21.11 to 11.09	Monitor the upper boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-346M1	-63.9 to -73.9	Monitor the lower boundary of the perchlorate and RDX plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-346M2	-24.21 to -34.21	Monitor the lower boundary of the perchlorate and RDX plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-346M3	5.52 to -4.48	Monitor the core of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate

Table 1
J-1 Range Northern Interim Groundwater Chemical Monitoring Network- November 2012

Location	Screen Interval (ft msl)	Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Parameters (b)
MW-346M4	40.41 to 30.41	Monitor the upper boundary of the RDX, HMX, and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-349M2	-7.31 to -17.31	Monitor the eastern boundary of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-369M1	-70.07 to -80.07	Monitor the western boundary of the RDX and perchlorate plumes.	**S**	**Explosives, Perchlorate**	**A**	**Explosives, Perchlorate**
MW-369M2	-32 to -42	Monitor the western boundary of the RDX and perchlorate plumes.	**A**	**Explosives, Perchlorate**	**NA**	**Explosives, Perchlorate**
MW-370M2	-26.54 to -36.54	Monitor the leading edge of the RDX and perchlorate plumes.	S	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-370M3	14.04 to 4.04	Monitor the upper boundary of the leading edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-401M1	-58.95 to -68.95	Monitor the leading edge of the J-1 Northern plume to confirm contamination is upgradient of Wood Road.	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-401M2	56.09 to 46.09	Monitor the leading edge of the J-1 Northern plume to confirm contamination is upgradient of Wood Road.	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-430M1	-71.18 to -81.18	Monitor the leading edge of the J-1 Northern plume to confirm contamination is upgradient of Wood Road.	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-430M2	-14.36 to -24.36	Monitor the leading edge of the J-1 Northern plume to confirm contamination is upgradient of Wood Road.	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-479M1	-50.75 to -60.75	Monitor downgradient of the main J-1 Range Northern plume.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-540M1	-64.61 to -74.61	Monitor the plume in the vicinity of Wood Road	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-541M1	-45.76 to -55.76	Monitor the plume in the vicinity of Wood Road	A S	Explosives, Perchlorate	A S	Explosives, Perchlorate
MW-547M1	-38.39 to -48.39	Monitor the leading edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-547M2	20.61 to 10.61	Monitor the leading edge of the RDX and perchlorate plumes.	A	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-549M1	-31.40 to -41.40	Monitor the leading edge of the RDX and perchlorate plumes.	S	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-549M2	8.70 to -1.30	Monitor the leading edge of the RDX and perchlorate plumes.	S	Explosives, Perchlorate	S	Explosives, Perchlorate

Table 1
J-1 Range Northern Interim Groundwater Chemical Monitoring Network- November 2012

Location	Screen Interval (ft msl)	Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Parameters (b)
MW-563M1	-24.91 to -34.91	Monitor the western edge of the RDX and perchlorate plumes.	NA	Explosives, Perchlorate	A	Explosives, Perchlorate
MW-564M1	-30.26 to -40.26	Monitor the leading edge of the RDX and perchlorate plumes.	NA	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-566M1	-34.32 to -44.32	Monitor the leading edge of the RDX and perchlorate plumes.	NA	Explosives, Perchlorate	S	Explosives, Perchlorate
MW-567M1	-25.65 to -35.65	Monitor the eastern edge of the RDX and perchlorate plumes.	NA	Explosives, Perchlorate	A	Explosives, Perchlorate

Notes:

J-1 = J-1 Range
ft = feet
m = meters
msl = mean sea level
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine
HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
SVOC = semi-volatile organic compound
VOC = volatile organic compound

(a)
A = annually
S = semiannually
(b)
Explosives = EPA Method SW846/8330
Perchlorate = EPA Method SW846/6850
SVOCs = EPA Method SW846/8270C
VOCs = EPA Method SW846/8260B

NA = Proposed change to sampling program.
NA = Well not in program.

Table 2
J-1 Range Southern Groundwater Chemical Monitoring Network- November 2012

Location	Screen Interval (ft msl)			Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Approved Parameters (b)
DP-379	-28.98	to	-33.98	Monitor the northeastern boundary of the J-1 S plume	A	Explosives	A	Explosives
DP-389	-7.26	to	-12.26	Monitor the lower boundary of the J-1 S plume	A	Explosives	A	Explosives
J1SEW0001	42	to	2	Extraction well for J-1 S ETI System, used to help calculate and confirm mass removal by the system	M	Explosives	M	Explosives
MW-131S	71.3	to	61.3	Potential source area well and northern boundary well to monitor explosives	A	Explosives	A	Explosives
MW-360M2	63.11	to	53.11	Monitor the source area and trailing edge of the J-1 S plume	S	Explosives	**A**	Explosives
MW-398M1	-10.72	to	-20.72	Monitor groundwater below core of J-1 S plume	A	Explosives	A	Explosives
MW-398M2	29.9	to	19.9	Monitor core of J-1 S plume	A	Explosives	A	Explosives
MW-400M1	-55.78	to	-65.78	Monitor downgradient of the leading edge of the J-1 S plume	A	Explosives	**S**	Explosives
MW-400M2	-1.92	to	-11.92	Monitor downgradient of the leading edge of the J-1 S plume	A	Explosives	**S**	Explosives
MW-402M1	-49.25	to	-59.25	Monitor downgradient of the leading edge of the J-1 S plume	A	Explosives	**S**	Explosives
MW-402M2	-14.35	to	-24.35	Monitor downgradient of the leading edge of the J-1 S plume	S	Explosives	S	Explosives
MW-403M1	-12.18	to	-22.18	Monitor downgradient of the leading edge of the J-1 S plume	A	Explosives	**S**	Explosives
MW-403M2	20.46	to	10.46	Monitor downgradient of the leading edge of the J-1 S plume	S	Explosives	S	Explosives
MW-480M2	9.56	to	-0.44	Monitor the southwestern boundary of the J-1 S plume	A	Explosives	A	Explosives
MW-481M1	-33.58	to	-43.58	Monitor the core of the J-1 S plume	A	Explosives	A	Explosives
MW-481M2	9.88	to	-0.12	Monitor the core of the J-1 S plume	S	Explosives	**A**	Explosives
MW-482M2	-16.63	to	-26.63	Monitor the northeastern boundary of the J-1 S plume	S	Explosives	**A**	Explosives
MW-482M3	58.08	to	48.08	Monitor the northeastern boundary of the J-1 S plume	A	Explosives	A	Explosives
MW-483M1	22.61	to	12.61	Monitor the southeastern boundary of the J-1 S plume	A	Explosives	A	Explosives

Table 2
J-1 Range Southern Groundwater Chemical Monitoring Network- November 2012

Location	Screen Interval (ft msl)			Rationale for Location	Current Sampling Frequency (a)	Parameters (b)	Approved Frequency (a)	Approved Parameters (b)
MW-488M1	12.8	to	2.8	Monitor the core of the J-1 S plume	A	Explosives	A	Explosives
MW-488PZ	43.14	to	33.14	Monitor the upper boundary of the J-1 S plume	A	Explosives	A	Explosives
MW-521M1	-21.74	to	-31.74	Monitor the northwestern edge of the plume south of base boundary	A	Explosives	A	Explosives
MW-522M1	-46.26	to	-56.26	Monitor near core of plume	S	Explosives	**A**	Explosives
MW-522M2	-13.26	to	-23.26	Monitor near core of plume	S	Explosives	**A**	Explosives
MW-523M1	-9.83	to	-19.83	Monitor the southwestern boundary of the plume	A	Explosives	A	Explosives
MW-524M1	6.32	to	-3.68	Monitor near core of plume	S	Explosives	S	Explosives
MW-525M1	-19.61	to	-29.61	Monitor the leading edge of the plume	S	Explosives	**A**	Explosives
MW-525M2	4.39	to	-5.61	Monitor the leading edge of the plume	S	Explosives	**A**	Explosives
MW-526M1	-11.28	to	-21.28	Monitor the leading edge of the plume	S	Explosives	**A**	Explosives
MW-527M1	-13.38	to	-23.38	Monitor the leading edge of the plume	S	Explosives	**A**	Explosives
MW-528M1	39.68	to	29.68	Monitor downgradient of source area along plume core	S	Explosives	**A**	Explosives

Notes:

J-1 = J-1 Range

J-1 S = J-1 Southern

ft = feet

m = meters
msl = mean sea level
RDX = hexahydro-1,3,5-trinitro-1,3,5-triazine
HMX = octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine

(a)

A = annually

S = semiannually

(b)
Explosives = EPA Method SW846/8330
Perchlorate = EPA Method SW846/6850

Yellow shading denotes changes to sample program

Table 3
J-1 Range Southern Hydraulic Monitoring Network- November 2012

Well	Easting Coordinate on Surface (N83 UTM m)	Northing Coordinate on Surface (N83 UTM m)	Surface Elevation (ft msl)	MP Elev (ft msl)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)	Mid Screen Elevation (ft msl)
90MW0033	374225	4616203	152.10	154.34	-2.63	-7.63	5	-5.13
90MW0036	373998	4616722	124.00	126.31	19.35	14.35	5	16.85
90MW0037	374009	4616876	157.10	156.42	47.21	42.21	5	44.71
90MW0041	373823	4616886	159.60	161.63	34.23	29.23	5	31.73
90MW0052	374193	4616629	129.80	132.50	34.87	29.87	5	32.37
90WT0010	374688	4616174	152.40	151.97	69.05	59.05	10	64.05
BH70-A	373882	4617359	164.88	165.79	59.38	49.38	10	54.38
DP-379	374279	4617054	160.42	162.46	-28.98	-33.98	5	-31.48
J1SEW0001	374216	4616909	N/A	161.35	44	4	40	24
MW-131M2	374087	4617258	167.30	167.02	-27.70	-37.70	10	-32.70
MW-131S	374087	4617258	167.30	167.00	71.30	61.30	10	66.30
MW-290M3	373814	4617213	164.50	163.73	20.03	10.03	10	15.03
MW-290S	373814	4617214	164.30	164.04	64.20	54.20	10	59.20
MW-360M1	374053	4617208	165.11	164.41	-81.89	-91.89	10	-86.89
MW-360M2	374053	4617208	165.11	164.37	63.11	53.11	10	58.11
MW-398M1	374215	4616913	161.43	161.09	-10.72	-20.72	10	-15.72
MW-398M2	374215	4616913	161.43	161.11	29.90	19.90	10	24.90
MW-400M1	374501	4616446	136.98	136.7	-55.78	-65.78	10	-60.78
MW-400M2	374501	4616446	136.98	136.69	-1.92	-11.92	10	-6.92
MW-400PZ	374501	4616446	136.98	136.43	72.32	62.32	10	67.32
MW-402M1	374419	4616370	140.89	140.25	-49.25	-59.25	10	-54.25
MW-402M2	374419	4616370	140.89	140.26	-14.35	-24.35	10	-19.35
MW-402PZ	374419	4616370	140.89	140.02	71.16	61.16	10	66.16
MW-403M1	374595	4616510	147.72	147.09	-12.18	-22.18	10	-17.18
MW-403M2	374595	4616510	147.72	147.09	20.46	10.46	10	15.46
MW-480M2	374237	4616721	153.13	152.77	9.56	-0.44	10	4.56
MW-481M1	374301	4616794	156.16	155.65	-33.58	-43.58	10	-38.58
MW-481M2	374301	4616794	156.16	155.66	9.88	-0.12	10	4.88
MW-482M2	374371	4616838	156.01	155.46	-16.63	-26.63	10	-21.63

Table 3
J-1 Range Southern Hydraulic Monitoring Network- November 2012

Well	Easting Coordinate on Surface (N83 UTM m)	Northing Coordinate on Surface (N83 UTM m)	Surface Elevation (ft msl)	MP Elev (ft msl)	Top Screen Elevation (ft msl)	Bottom Screen Elevation (ft msl)	Screen Length (ft)	Mid Screen Elevation (ft msl)
MW-482M3	374371	4616838	156.26	155.78	58.08	48.08	10	53.08
MW-483M1	374177	4616833	162.13	162.54	22.61	12.61	10	17.61
MW-483PZ	374177	4616834	165.00	162.25	56.71	46.71	10	51.71
MW-488M1	374227	4616942	162.42	162.51	12.8	2.8	10	7.80
MW-488PZ	374227	4616942	162.42	162.51	43.14	33.14	10	38.14
MW-521M1	374299	4616623	136.26	136.13	-21.74	-31.74	10	-26.74
MW-521M2	374299	4616623	136.26	136.09	34.26	24.26	10	29.26
MW-522M1	374363	4616536	151.74	151.43	-46.26	-56.26	10	-51.26
MW-522M2	374363	4616536	151.74	151.42	-13.26	-23.26	10	-18.26
MW-522PZ	373363	4616536	151.74	151.37	33.74	23.74	10	28.74
MW-523M1	374292	4616436	148.17	147.87	-9.83	-19.83	10	-14.83
MW-523PZ	374292	4616436	148.17	147.89	34.17	24.17	10	29.17
MW-524M1	374444	4616681	154.32	154.03	6.32	-3.68	10	1.32
MW-524PZ	374444	4616681	154.32	154.03	35.32	25.32	10	30.32
MW-525M1	374449	4616269	152.39	152.05	-19.61	-29.61	10	-24.61
MW-525M2	374449	4616269	152.39	152.07	4.39	-5.61	10	-0.61
MW-526M1	374367	4616279	152.72	152.44	-11.28	-21.28	10	-16.28
MW-526PZ	374367	4616279	152.72	152.46	35.72	25.72	10	30.72
MW-527M1	374287	4616286	151.62	151.32	-13.38	-23.38	10	-18.38
MW-527PZ	374287	4616286	151.62	151.32	33.62	23.62	10	28.62
MW-528M1	374108	4617067	156.68	156.42	39.68	29.68	10	34.68

ft msl = feet mean sea level
N83UTM m = North American Datum of 1983 Universal Transverse Mercator coordinates in meters